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FLYING

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APRIL, 1955 VOLUME 56, NUMBER 4

FLYING

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THE COVER: De Havilland *Beaver* on floats as photographed by Howard Levy. See page 58 for further details.

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MAILBOX

COMMON SENSE RULES

. . . In recent years I have been frequently shocked by the apparent lack of importance many pilots attach to those Government and "common sense" rules that are so basic to aviation safety.

The fourth paragraph of "More on Night Flying" in your January issue is all too typical. For J.R.H's information, proper altitude separation on Civil Airways is *equally* as important during daylight hours—even if you are VFR.

It is this very reason that prompts me to enjoy night flying more than day flying. Those people who fly at night seem to attach more importance to rules of good airmanship than they do during the day.

It's food for thought, is it not?

RAYMOND LANK

Beaurepaire, P. Q.

● *It is indeed food for thought. With the tremendous increase yearly of all types of flying, swivel-neck alertness is not enough.*—ED.

XC-99

In your January issue, page 27, the picture in the lower right hand page is

an XC-99 and not a B-36 as the caption states.

W. R. HILBRINK

Springfield, Ohio

● *Mr. Hilbrink took the picture so he certainly should know.*—ED.

FEES AND MORE FEES

. . . On December 28 at 2:00 a.m., I landed at Greater Pittsburgh Airport in my Piper *Tri-Pacer* en route from Washington, D. C. I had hoped to be able to continue to Detroit but a low in the Great Lakes region prevented me from progressing any farther. I was informed by the registrar that there would be a $2 landing fee, plus a fee of $2 every 12 hours as long as my plane was on the airport. This is approximately 300 per cent higher than any tie-down fee I have ever paid in my life.

That night my companion and I stayed in the airport hotel (price $15.00), had breakfast, and took an airliner to Detroit. It wasn't until the following Sunday that I was able to return to Pittsburgh and pick up my plane. The fees alone on it were $22.

This all seems to me terribly shortsighted. Air traffic at Greater Pittsburgh Airport is far from congested. The County has a great investment in one of the prettiest airports in America. Apparently it is the purpose of the Aviation Commission to discourage all but the airlines from using these facilities. Private and corporate traffic, although it could easily bring in more money in business at the airport night club, hotel, shops and restaurants, is going to avoid Greater Pittsburgh like the plague.

As for myself, I will not only never again land at Greater Pittsburgh, but I will also avoid bringing any business whatever to the city or county until this situation is rectified. This in spite of the outstandingly courteous and sympathetic treatment I received from all personnel.

FRANCIS D. SHELDEN

Detroit, Mich.

● *When one of the Allegheny County Aviation Commissioners was questioned recently about the $2 landing fee, he countered by stating that, after all, private cars must pay for use of the Pennsylvania Turnpike. The answer to that one, of course, is that pilots would have no objection to paying 1½ cents a mile for the use of a Greater Pittsburgh Airport runway. As to the parking fee, there are more arguments pro and con than space will permit us to cover. The County claims that its responsibility for parked airplanes means high insurance costs and points out that drivers pay to park cars—why not pilots for parking planes? And so it goes, ad infinitum. There can be little doubt, however, that the welcome mat for private and corporate aircraft at Greater Pittsburgh Airport is conspicuous for its absence.*—ED.

TO THE ART DIRECTOR

My subscription goes way back to the days in 1939 when I started flying an OX-5 *Travel-Air*, through three years of service in the Air Force and for the

years since the war. I have enjoyed reading every issue from the old POPULAR AVIATION to the current issues of FLYING. While it may be difficult to find articles of interest to suit each subscriber, I find you have done admirably well in this department. I have found your articles of interest when flying *Travel-Airs* through DC-4's and now back to a *Bonanza*.

One of the features of your publication which has received little comment is the production layout of the book. The articles are well laid out and illustrated, the covers are well chosen. All in all, the format and content of the magazine, coupled with an excellent printing job, make it a pleasure to read.

E. E. CARPENTER, Major, USAFR
Cleveland, Ohio

WISCONSIN'S ROY TRUE

I would like to call your attention to a mistake about the picture on page 19 of the February issue in the article, "Toward a Plane for Everybody." Instead of Roy True, who built the *Slow Poke*, being from Monroe, Michigan,

he is from Monroe, *Wisconsin* and is operator of the Monroe Air Service. We are very proud to have him as operator of our air service as well as we are proud of Monroe, Wisconsin, the Swiss Cheese Capital of the U.S.A.

HOLLIS SCHUTT
Monroe, Wisc.

LIFE INSURANCE

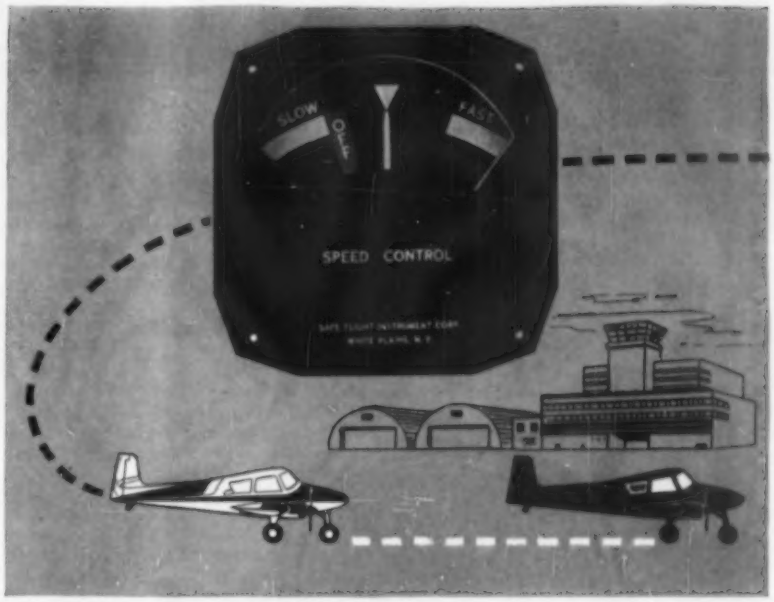
One of the major deterrents to private flying is the life insurance problem. This fact is widely publicized by the standard question asked of every life insurance applicant as to whether he engages in private flying.

Insurance companies must certainly have studied the statistics carefully before adopting this discrimination against pilots as a group. Whether they are actually justified is open to question. But surely many of us who fly our own planes year after year find this insurance penalty difficult to accept.

To learn the insurance companies' side of the question, an inquiry was addressed to one of the largest "old line" firms. The following reply was received from their Director of Underwriting:

"According to the 1954 edition of Accident Facts, which is published by the National Safety Council of Chicago, the fatality rates during 1951-1953 per 100 million passenger miles for the various modes of transportation were:

(Continued on page 64)



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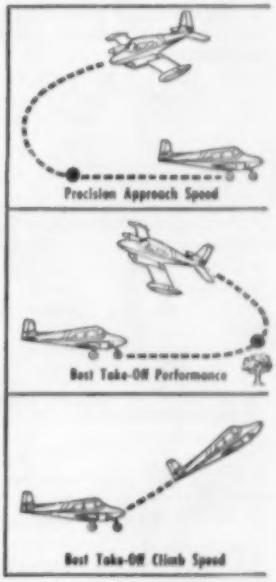

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Briefings . . .

VETERANS HAVE UNTIL August 20 to enter flight training under the Korean G.I. Bill. This is made possible by a dividend from the 83rd Congress in the form of a year's extension of training entry time.

LAGUARDIA HOTEL, a 40-room motel situated across the parkway from LaGuardia Airport in New York, was booked solid the second day after it opened. Limousine service, for the two minute drive to the hotel, picks up passengers at each airline. Rates for single occupancy range from $8 to $14. Half-rate applies if check-in is after 4:30 a.m. and check-out is before 6 p.m. The management is already breaking ground for construction of an additional 215 rooms.

WHEN THE NATIONAL NETWORK of the Ground Observer Corps is formally requested to report "severe weather" conditions by Air Force regulation, the activity will very likely be known officially as "GOREPS," meaning GOC weather reports. This will put GOC in stature equal to other official weather reporting activities known as "PIREPS" (pilot reports), "RAREPS" (radar reports), and "HUREPS" (hurricane reports).

OWNERS OF DC-3's can now trade in the wings of their planes for a pair that will hold 400 extra gallons of gasoline, according to Jack O'Brien, manager of the Garrett Corpcration's Aviation Service Division, Los Angeles, which introduced the innovation. Flight range is increased by about 800 miles.

THESE TWO BRITISH books are valuable new additions to aviation literature and source reference. "Development of the Guided Missile" is a revised and enlarged second edition, contains all the main information available on the subject. Price is $4.75. "Jet" was written by Sir Frank Whittle, is the story behind his development of the first jet engine. Price is $6.00. Philosophical Library, 15 E. 40th St., New York 16, N. Y.

SOCONY-VACUUM OIL Company will fuel the first turbo-prop airliners to be placed in commercial service in the U. S. Contract for the jet fuel, known as JP-4, has been awarded by Trans-Canada Air Lines which will put the first of 22 turbo-prop *Viscounts* into service between New York's Idlewild Airport and Montreal.

ANALYSIS OF PIPER aircraft users in 1954 shows 97 per cent of *Tri-Pacer* owners report they use their planes in their business averaging 320 hours or almost 40,000 miles a year. Growing use of instruments and radio is shown by the 85 per cent of *Tri-Pacer* owners who now have Omni equipment against only 17 per cent in 1951; 75 per cent also now have full advanced instrument panel, against only 8 per cent in 1951.

RUGGEDNESS OF CANADIAN helicopter operations is shown here with the landing of a United Helicopters Limited S-55 on a wharf in a northern Newfoundland fishing village. The ship is under charter by the Canadian Department of Fisheries. United is a wholly owned subsidiary of Okanagan Helicopters, Ltd., Vancouver.

CONVAIR HAS ENTERED a four-engine, 60 passenger, elongated version of the Convair-liner in the American Airlines short-medium range turbo-prop airplane competition. Several different power plant combinations have been presented for the new model including the Rolls Royce RDA7 *Dart*, the Allison T-56 and the Napier *Eland*.

ZOOLOGISTS in Alberta, Canada, use helicopters to trace migratory habits of buffalo. Hovering low over herds, aircraft crew members "brand" the animals with squirts of paint from a gun.

THE ROYAL GULL is now on a demonstration tour of the Caribbean area and Gulf states. Royal Aircraft Corp., of Milwaukee, Wisc., expect to establish a dealer network in the tour area for the gull-wing, twin-engine, pusher amphibian.

A FORT DEVENS ARMY PRIVATE from Brooklyn, N. Y., has been granted a government patent on a jet engine which he claims is lighter and more powerful than any in use. Pvt. Si Waitzman, 25, a graduate architect from the University of Pennsylvania, says his invention is a combination of the best features of the ramjet and the turbojet.

ROBERT E. GROSS, president and board chairman of Lockheed Aircraft Corp., has been elected president of the Institute of the Aeronautical Sciences for 1955. Mr. Gross will be the 23rd president of the Institute whose membership of 10,000 includes the nation's leading aeronautical engineers.

LIFE INSURANCE AT STANDARD RATES is now available for civil aircraft pilots through Security Benefit Life Insurance Company, Topeka, Kans. Three policies: Life paid up at 80; Endowment at 60; and Six-Year Term; are available for private pilots age 25 or over who fly their own or company planes for business or pleasure.

TO MEET THE URGENT NEEDS of French aero clubs which are having difficulty obtaining aircraft at reasonable prices, French government and aviation groups are comparing existing aircraft to choose one which will best meet requirements. This plane will then be built in large numbers, with manufacture spread among those companies which are specialists in light aircraft.

MORE THAN 100 PIPER *Apaches* have been delivered since the first came off the production line last May. *Apaches* are now being flown in every part of the United States, as well as in Canada, Central and South America and Europe.

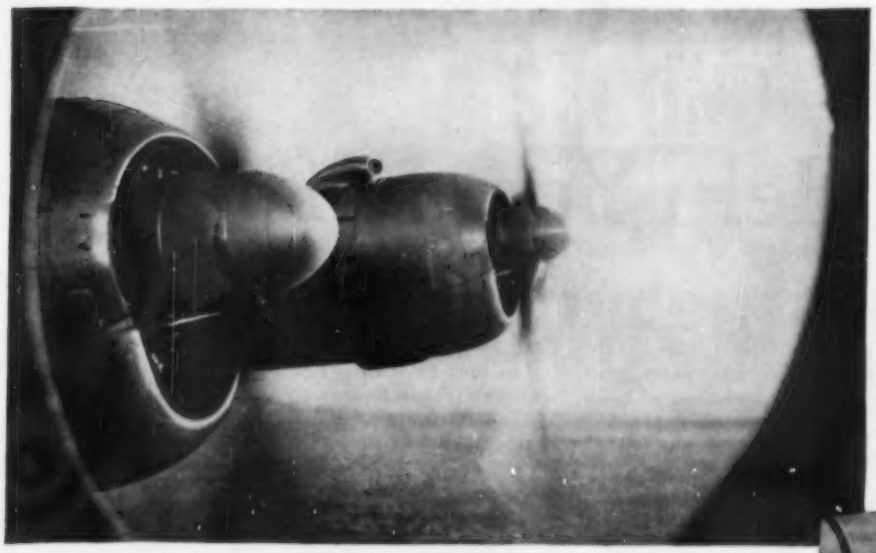
CAPABLE OF HIGH FREQUENCY transmission and reception over more than a 1,000 mile range, three transceiver models built by Sunair at Fort Lauderdale, Fla., are making radio news, particularly in Latin American countries where

range is of great importance. Shown here is Model S-5-DTR, with five pre-selected channels between 2,000 and 10,000 kcs. Price is $795 for transceiver, dynamotor, 5 transmitter and receiver crystals; available for 12 or 24 volt systems. Also available are a remotely controlled model with 5 channels, and one with 11 channels.

NEARLY 300 PERSONS IN 100 aircraft participated in the annual Miami-Havana air cruise sponsored by the Florida Air Pilots Association January 11-14. A similar but longer cruise to Cuba, sponsored by the Florida Aero Club, will be

(Continued on page 56)

FLY WEATHER-WISE



These weather items prepared in consultation with the United States Weather Bureau

Rain drops from heavy cumulus clouds which fall from colder altitudes may cool cylinder heads enough to cause engine to misfire. Avoid heavier showers wherever possible.

Unlike showers, rain falling from stratified cloud layers may be warmer than the air through which it falls. Be prepared for poor visibilities in the cold air near the ground, as fog is likely.

To avoid turbulence along squall lines, plan your trip through the northern quarter of an active low. Although instrument conditions and ice in the winter may be encountered, the severest weather will be avoided.

Even though stations report good weather—conditions in between are occasionally poorer. You may be unable to maintain visual contact. Check all available information on en route weather as well as your terminal weather.

Best Pair to Get You There

STEERING CLEAR of stormy weather can add miles to your flight. Weather-wise pilots safeguard themselves with an extra margin of safety...keep tanks filled with Mobilgas Aircraft... protect engine performance with Mobiloil Aero. These famous products are the result of 89 years of research and experience—favorite with aviators since the Wright Brother's first flight. Why accept less for your plane?

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FLYING
VOLUME 56, NO. 4
APRIL, 1955

AN EDITORIAL

Help Yourself

ANYTHING which saves the little fellow from hard knocks is down our alley. And just now we've got hold of something that may take a few kinks out of his problems.

As flight and navigation aids have multiplied and the majority of privately owned aircraft become highly forgiving of inexpert handling, the amateur pilot has ventured farther and farther afield.

That's fine. Unhappily, however, he wasn't originally trained along these lines and, when he runs into the inevitable spot of surprise weather, he may be in trouble up to his collar buttons.

Harking back to our own sweat and tears along this line and after studying a lot of recent accident reports, we concluded that something could be done to help the lads who fall into spins or build up intolerable speeds in spiral dives.

Of course, the problem can be tackled from a number of angles . . . and should be. For example, a more comprehensive use of in-flight weather reports by the local weather man who briefs the pilots would eliminate a lot of surprise weather emergencies. Radio frequencies could be standardized so that a pilot would not have to be an expert piano tuner to operate his communications. And, for the sake of upcoming generations of pilots, the requirements for a private ticket could be geared to emphasize cross-country and instrument emergency.

But fundamentally and for the sake of the pilot who is in current need, the approach now has to be directed at improving that individual's capability. It isn't enough to advise him to duck emergencies. He certainly should if he can; but sometimes he doesn't know he's in trouble until it's too late to duck.

Of course, the perfect solution to all such problems would be to make a precision instrument pilot out of all ladies and gentlemen who go down to the horizon in airplanes. And let it be said that there are some private pilots who are as thoroughly competent as any professional.

The bulk of amateurs however, have neither the time, opportunity nor finance to attain and keep current the kind of skill which typifies the airline captain or the military expert. It is this bulk of folk who need help.

Can they be helped to a degree which will see them able to face up to emergency? Can the help be so simplified as to be available to pilots whose panels boast only these basic flight instruments—turn-and-bank, sensitive altimeter, air speed indicator and magnetic compass? Can the help be such that it lends itself to self-teaching with proper checks?

These are some of the limitations we have to accept until the day when everybody can afford automatic pilots and all the kindred "fixings."

Some months ago we took our problem to one of the world's greatest acknowledged experts on the subject of instrument flight training.

Because he is not only a great airman, but a great friend of the whole fraternity of amateur pilots, Col. Joseph B. Duckworth listened sympathetically to our proposition and accepted the commission to tackle the problem. After some six months of study and analysis, he produced the thesis which in two parts is carried in this and the May issue of FLYING.

As an introduction to Colonel Duckworth's thesis, the Honorable Fred B. Lee, Civil Aeronautics Administrator, and himself a renowned student of flight training, has done the foreword.

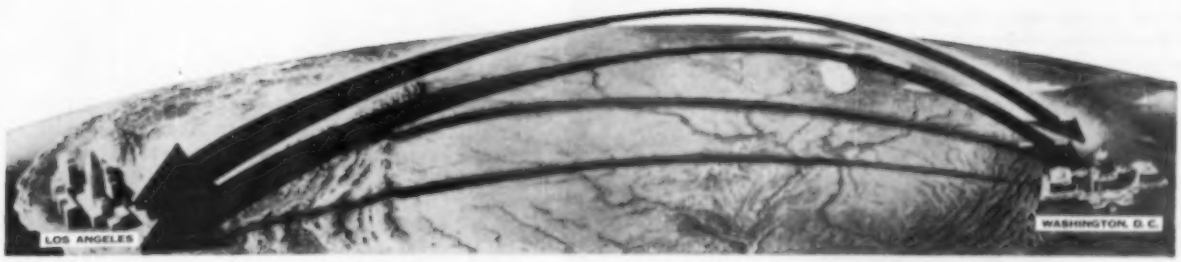
Here at FLYING, we do not pretend to be experts on the subject but our working staff does aggregate more than 100 years of pilot experience, and Colonel Duckworth's thesis makes a world of sense to us.

It is presented in the profound hope that it will inspire the amateur pilot to make himself master of his emergencies. If it saves one life, or so much as opens up fresh vistas for the private pilot and the light aircraft industry, we shall be well paid.

Gill Robb Wilson

Gill Robb Wilson
Editor and Publisher

AMERICAN ADDS A SECOND NONSTOP DC-7 BETWEEN WASHINGTON D.C. and LOS ANGELES



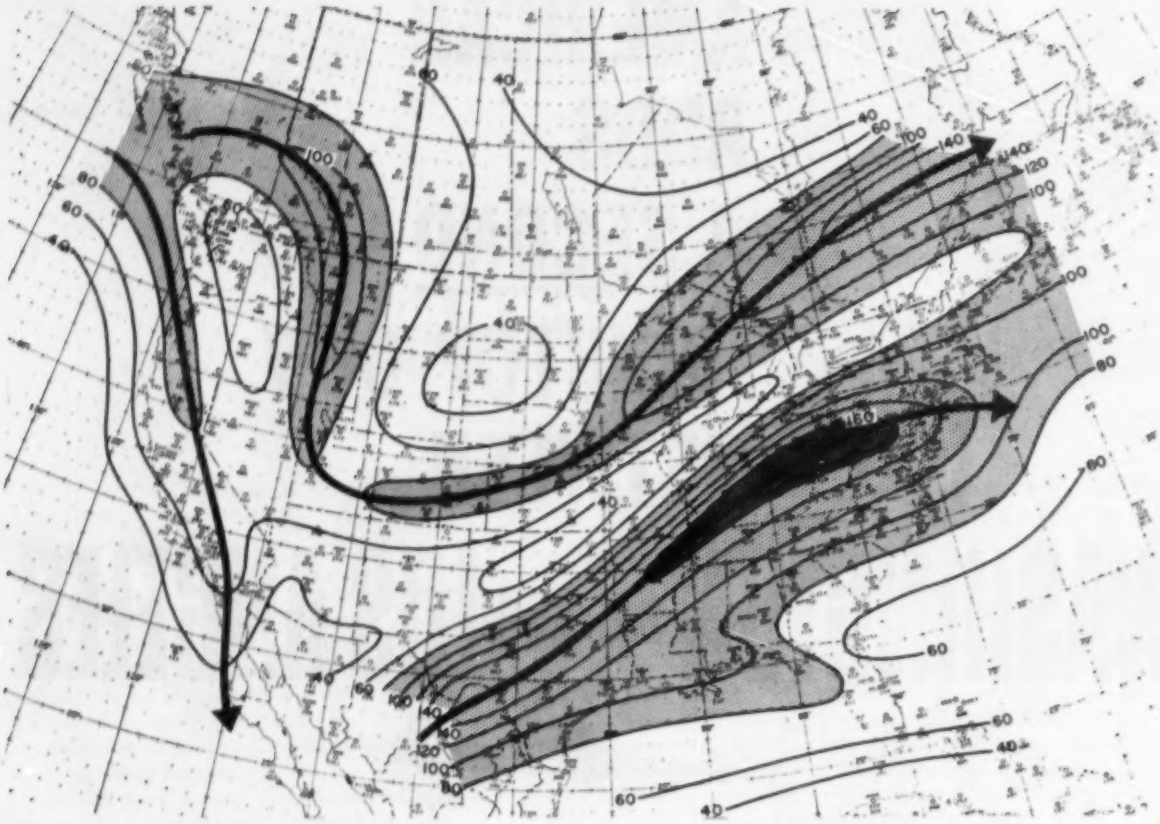
FASTEST AND ONLY NONSTOP DC-7 SERVICE BETWEEN THESE 2 KEY CITIES

2 NONSTOP Statesman FLIGHTS DAILY

Lv. WASHINGTON	(EST)	12:50 AM	12 NOON
Ar. LOS ANGELES	(PST)	6:05 AM	5:15 PM
Lv. LOS ANGELES	(PST)	9:45 AM	9:45 PM
Ar. WASHINGTON	(EST)	7:35 PM	7:35 AM

PLUS 2 ONE-STOP FLIGHTS DAILY

America's Leading Airline **AMERICAN AIRLINES** INC.



The path and direction of the jet stream as it crosses the United States is shown in shaded areas of the chart.

JET STREAM

Mysterious weather phenomena which can serve as a weapon for military use and as a boon to long range civil commerce.

By GLENN INFIELD

LIEUTENANT R. R. DICKSON, Navy weather forecaster at the Naval Air Station, San Diego, Calif., looked up from his weather maps.

"It will take you 3 hours, 41 minutes to get to New York."

The three Navy pilots looked surprised for a moment, then started laughing.

"You realize, Dickson, that you just had us set a new coast-to-coast speed record," Lt. Comdr. Francis Brady said.

"Go ahead and laugh," Dickson said. "Just remember what I said. . . 3 hours, 41 minutes."

Exactly 3 hours, 45 minutes, 30 seconds after his F9F Grumman fighter left the runway at San Diego last spring, Lt. Comdr. Brady flashed across Floyd Bennett Field in New York, unofficially cracking the previous record of 4 hours, 8 minutes, 5 seconds. And to emphasize the accuracy of Dickson's forecast, Lt. Wallace Rich made the flight in 3 hours, 47 minutes and Lt. John Barrow took 3 hours, 46 minutes. The general impression, based on most news releases, was that the planes just happened to find the jet stream by accident and used it to good advantage. Actually, they had a precise forecast for each leg of the trip and had a tail wind component of 100 knots or better.

Dickson's forecast is an example of the type of prediction that will be possible in the near future if "Project Jet Stream" is a success. No research program in our country today is more important to all of us than this joint study by the Air Force and Navy of the invisible 200 to 300 mph river of air flowing overhead. This Gulf

Capt. Robert H. Dowd at the controls of the specially equipped B-29 "flying laboratory" assigned for use on "Project Jet Stream."

Lt. Comdr. K. D. Smith (right) and R. B. Earhart, Aviation Machinist's Mate 1/c, work on Naval Air Test Center's study of jet stream.

Stream of the air ocean can make a fast flying jet stand still, or push it to fantastic speeds and double its range. At its peak turbulence, it can shake a pilot around in the cockpit like an ice cube in a cocktail shaker. It affects our guided missiles—throws the rockets far off their predicted flight paths.

Roaming the skies far and wide, tracking the jet stream, is a group of Navy and Air Force planes. At the Naval Air Test Center, Patuxent River, Md., two Douglas *Skynights* roar into the sky seven days a week, regardless of weather, whenever the jet stream is within reach. This calls for some rugged flying plus a lot of know-how to penetrate the snowstorms, icing levels and heavy overcasts prevalent during winter months. The pilots, under the direction of Lt. Comdr. Kenneth D. Smith, the project officer, take it in stride. This is the first time that jet planes have been used to hunt out this unusual phenomenon.

At Patrick Air Force Base, Fla., the 6520th Flight Test Squadron, Detachment 2, of the Air Force, commanded by Capt. Robert H. Dowd, puts up daily B-29 probing flights, while a B-47 jet bomber stationed at MacDill Air Force Base handles the research flights above 30,000 feet.

This invisible river of racing air has been a mystery ever since its discovery during World War II, when B-29 pilots reported that, on reaching Japan at 30,000 feet, they often stood still with their throttles wide open. By 1947, a University of Chicago weather team had analyzed enough pilot reports from all over the world to learn that it was a global wind whipping endlessly around the earth, approximately 2,000 miles north of the equator. Later it was discovered that there was a corresponding jet stream south of the equator.

It had been theorized, and preliminary analysis of probing flights made this year supports the hypothesis, that the wind field within the jet stream core is composed of "fingers" of high wind speed. The Northern Hemisphere stream has several splits in it. In order to be put to use, these fingers must be plotted. One split occurs when the high speed winds hit the Himalayan mountains. The northern fork whips across China where the cold Arctic air from Siberia acts like an afterburner on a jet engine, boosting it to tremendous speeds. The stream was clocked at 450 mph at 38,000 feet over Japan.

It continues, though at a slower pace, across the Pacific, over the California-Oregon coast, then is speeded up again by pressure over the Cascade-Sierra Nevada slopes. It completes the high altitude merry-go-round by swirling over the Rockies, across to the east coast, over the Atlantic and Europe, and back to the Himalayas. Any pilot who can maneuver his plane to take advantage of any fingers of this merry-go-round wins the brass ring. Aircraft, on eastbound flights from Tokyo to the U. S. during the winter months save about 2,200 gallons of gas and six hours time per trip by flying in the jet streams. Recently Capt. R. P. McManus, flying for Northwest Airlines, rode a 120 mph jet tailwind from Tokyo to Anchorage, in nine hours and 19 minutes air time, the only stop being at Shemya Island.

Shy, wiry, redheaded Dr. Joachim Kuettner, an Air Force geophysicist at the Air Force Research Center, says that one of these days some flier will be able to fly from coast to coast without an engine, by riding the jet stream. "If the right equipment is available—such as a glider with a pressurized cabin and large enough to hold two men—motorless flights halfway across the nation will be a reality within a few years," he states.

On one experimental flight—Dr. Kuettner's glider was plane-towed to 12,000 feet above the Sierra Nevadas and released. He then used the updrafts from mountain air waves until he was between 30,000 and 40,000 feet. There he caught the jet stream and, in less than four hours, set his sailplane down at Williams, Ariz., 400 miles away.

Just why the jet stream twists and turns, meandering like a brook through a cow pasture, or what powers it, isn't known for certain. Much more data is needed and most of it from the China, Siberia and Tibet area which is restricted to our planes. Meteorologists *think* the continuously rising warm air masses at the equator force a layer of air up against the cold fronts steadily pushing in from the polar regions. This layer of air, not being able to go further up or down because of the terrific pressures of the two air masses, squirts out from between them like toothpaste from a new tube, producing the jet stream. Another aid to the stream's high velocity is the earth's rotation.

The altitude of the stream varies considerably, having been reported at all levels from 15,000 feet to 50,000 feet. In March the Northern Hemisphere jet stream starts rising, not to come back down to lower levels until mid-October. This appears to be more proof that the altitude of the jet stream depends on the pressure of the warm air mass pushing it from underneath. It is hoped that this theory can be proven from the data gathered by the tracking planes of Project Jet Stream.

It is also thought that storms are formed where the jet stream wanders. The for- (*Continued on page 62*)

DEEP GREEN CRACK-UP

Forced down in the lush Amazon jungle without any survival equipment, three men trekked back to civilization.

By CHARLES CECIL FULLER

Illustrated by Ed Valigursky

A SEA OF GREEN spread itself 2,000 feet below like new-loomed velvet, faintly webbed with silver threads. Ordinarily the vista was monotonous. Now, late in afternoon, three men looked down on the Amazon jungle which waited for their plane whose single motor was gasping for breath!

Lt. Gonzalo Ruales, civilian pilot, cocked an ear and decided he was fast running out of power and luck. His lips pursed in a low whistle as the storm burst into full fury. Rain lashed across windows. Far and near, lightning jagged the black clouds. A steady crash and roll of thunder beat at eardrums, and the little ship danced with the gale.

Ruales studied a chart, then snapped on his radio and adjusted padded earphones. He glanced at his two military passengers before speaking calmly into the microphone.

"Mayday! Mayday! Ruales calling enroute from Rio Villano to Pastaza-Oriente. Forced off course in storm with failing engine. Forced landing near area believed to be Allushin . . . Allushin area. Mayday! Mayday!"

"Any contact?" barked Lt. Col. Francisco Martinez, beside the pilot.

Ruales shook his head, waving a hand at lightning flashes. Why mention that the radio had gone dead! He shoved the wheel forward and nudged his ship into a steeper glide.

"Bang! There goes our engine!" grunted Martinez, as exhaust sounds ceased.

"Now what?" urged Lt. Julio Alvear from a rear seat. "No parachutes!"

"They're no good here," Ruales said, shrugging. "More likely to hang than save you in that mess below." His keen black eyes were flicking across the vast carpet and weighing the problem.

"We'll drop in a long glide, pick a soft spot—" Ruales grinned ironically "—and then stall in as we rake the tree tops. With luck I can kill most forward speed at the last instant. Then we'll perch on the upper branches."

Lt. Col. Martinez was Commander of the 11th Oriental Battalion, guarding that chunk of Ecuador's frontier known as the *Oriente*, pure jungle dotted in several spots with airfields at tiny military outposts along the eastern Ecuador-Peru border. Lt. Alvear was an Army Paymaster.

These handkerchief ports link the outer world to the handful of soldiers who man the stations. Without airlift, all rations and equipment would take weeks of transport by canoe and on backs of Indians through the dripping jungles.

THIS present flight had started as a routine inspection tour by Martinez, taking along the paymaster. But at the last moment, the Air Force had ordered special plane maneuvers which stripped the Pastaza-Oriente field. Martinez, to keep his schedule, had been compelled to use a plane of TAO—Transport Air Oriente—owned by Ruales Brothers, who piloted their own ships. Ruales had been jungle-hopping for several years, having quit the Air Force to establish his freight-mail-passenger service when and where possible in the rain forests. This was his first misfortune.

Now he was trying to envision, as the trees crept closer to his plane's belly, just where he was in relation to jungle trails and rivers but the storm blotted out all landmarks. This region offered about the worst place in the world to attempt walking. The terrain was knifed through and through with deep chasms cut by torrential downpours and the ship held not an iota of provisions. Escape to civilization would be rugged indeed!

Ruales picked his landing site as these considerations raced through his mind. Ahead, through sheeting rain, could be seen a large cluster of trees whose crowns all reared nearly equal in height. He gauged their distance and sloughed off some altitude. As the moment to wash-out his beautiful ship rushed close, his face grew bleak. Tree tops merged into a blurred mass of branches streaking past a scant hundred feet below. The pilot's eyes were calculating every move in split-seconds. Survival hung on the speed of his reactions at precisely the right instant. Martinez sat rigid and silent.

Fifty feet! Then the slim margin dipped to twenty-five. Their passage now created a suction which tossed and whipped upper branches like a storm. Those limbs began to loom equal in size to legs of elephants. Strange updrafts and eddies buffeted the craft as she mushed on.

Ruales fought the wheel with cool skill. A small limb whacked on an elevator. Instantly, he hauled back on the wheel. They could feel the plane drag and slow herself. Stalling speed sent a shudder through the fuselage. The tug of gravity became inexorable. Trees bit viciously, gnawing at tail assembly. The din of slapping branches swelled inside the cabin. Wing tips sailed away. The feathering prop chewed out a path, raining a cascade of leaves and twigs over the windshield.

EVERY single blow combined to check their pace. The ship swam through tree tops as in thick green soup. All ended in a titanic thump. The fuselage rammed squarely into a huge spread of branches. Like a plump moth, the ship folded her wings and, settling ever so gently, was lowered by the yielding limps and giant vines as slowly and securely as if riding on a mammoth elevator!

The men inside sat breathless, each expectant of an aftermath. Seconds stretched into eternities. Then came a bump from contact with the forest floor, and again the jungle took up its rain-drenched silence. Tense bodies had suffered only bruises, except for a slight cut on Alvear's forehead.

"Whew!" Martinez broke the silence. "We're safe! If we get outside alive I'll take a vow to my patron saint."

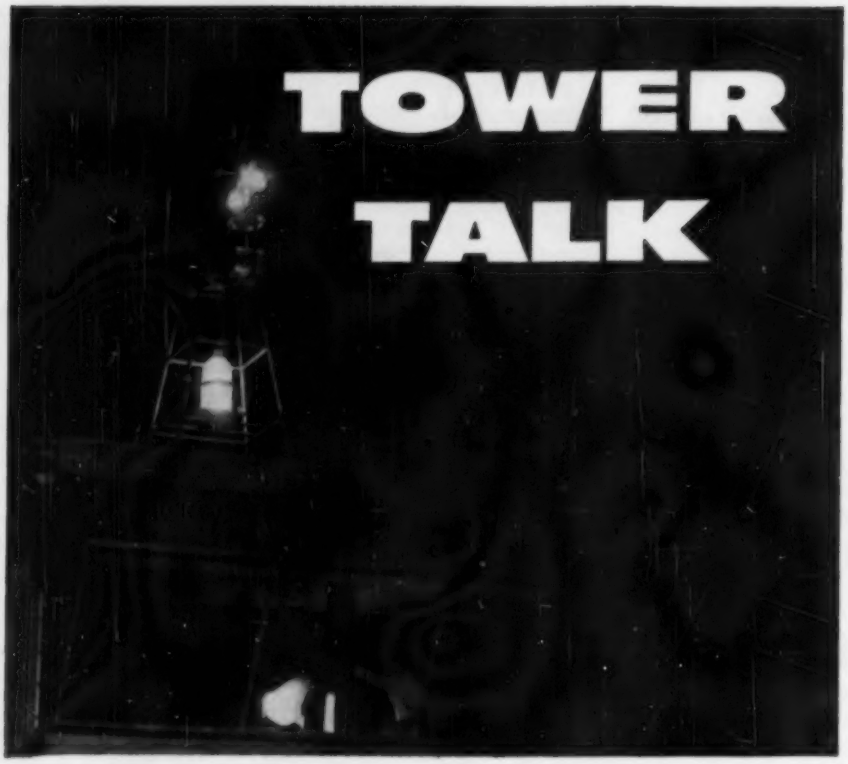
Ruales laughed, and forced open a door and flung out a blanket and one raincoat—all there was. Then slowly the men crawled from the crumpled cabin.

Protected by his flying jacket, Ruales insisted his companions use blanket and raincoat. He led them 500 yards from the wreckage and found metal sheeting that had been stripped from a wing. With it they built a rough lean-to. Only one man was a smoker, and his matches had quickly disintegrated from moisture, so they were without fire for warmth or to signal. By now darkness had fallen. The landing had occurred at 5:25 p.m.

Unfortunately, Ruales did not know that a few minutes earlier he had passed over my jungle home along the Rio Bobonaza where sound of his ailing motor had been clearly audible to my wife and me as we watched him vanish into the storm. Our big and level *yucal* would have made a splendid emergency landing field, with small damage to the ship from mowing down thin-stemmed yucca, but this all would have been virtually impossible to deduce from aloft. And Ruales, at the moment of passing over, was busily engaged with both storm and engine.

As night cloaked the group, Ruales took charge and the other two seemed to welcome it. "We'll post a guard," he told them. "Our greatest danger lies in a surprise attack by pigs. Wild hogs, run in bands, up to a hundred, and they hate human scent. You'd better pick a good tree if they come at us; good enough so razor tusks can't cut it down!"

They drew lots for guard duty, rank forgotten, and to Ruales fell the first four-hour trick. Martinez and Alvear bedded down, wet, shivering and hungry, for their first night in the bush. All were a (*Continued on page* 68)



TOWER TALK

By ARLINE BAKER

ABOUT THE AUTHOR:
Arline Baker is an Instrument and ATR Flight Instructor for Skyways School of Aviation Troutdale, Ore. She started flying in 1940, served as test pilot in the WASP and has held an Airline Transport Rating since 1951.

Radio controlled airports are a pleasure to use if you follow these simple instructions.

IS THE RADIO EQUIPMENT in your airplane actually an asset to you; does it add to your flying safety, convenience, and pleasure? Or, are you one of the many pilots who is purposely avoiding radio-controlled airports because radio procedures are confusing to you? If you belong in the latter category, it might be gratifying to know that you have lots of company but we are confident that full utilization of your radio would be even more satisfying.

For landing and take-off clearances, "technical" terms are not necessary. Ordinary conversation will do the job. All you have to do is start the conversation and the tower will pick it up from there. But to start the conversation, it is necessary to understand your transmitting and receiving equipment. We will attempt to explain some of the mysteries about the use of various frequencies.

Your first conversation will be the hardest. There is no way to eliminiate it. Take an instructor with you the first time to help you overcome mike fright and, after that first attempt, you should have no difficulties.

Aside from a deliberate violation of instructions, there is only one unpardonable error that can be committed. *Never acknowledge an instruction you do not understand.* Ask that it be repeated, even if it takes several repetitions. It is even your privilege to ask Air Traffic Controllers to talk slower. Tower personnel try to do this if they realize you are unfamiliar with the airport, but occasionally a slip-up occurs because they are accustomed to talking rapidly to airline traffic.

THE PRO'S NEST

In any communication with the tower or range, the frequency on which reply is expected should be specified in the initial call:

EXAMPLE: "(PORTLAND) TOWER THIS IS CESSNA NINE ZERO TWO FOUR COCA RECEIVING ONE ONE EIGHT DECIMAL SEVEN OVER."

Otherwise, reply will automatically be given on low frequency.

One of the best things you can do for both your own and the tower personnel's benefit is to visit the tower and watch them handling traffic. You will appreciate their side of the picture better, and listening to the conversation of others will ease your mind as to how you sound. For all potential instrument pilots, a session in the tower while IFR traffic is being handled is a *must.* Incidentally, you'll find tower personnel extremely cooperative. They want to help you do it right, not keep their procedures a secret.

Remember that aircraft radio frequencies are basically a "party line" system and it takes cooperation, as well as an understanding of who uses that line, to keep the system working without interference. Because of the number of users of the "party line," it is desirable to keep conversation to a minimum. Use of standard phraseologies, proper microphone technique, and clear enunciation will make your conversations more effective.

When calling the range station or tower, listen first to find out whether a conversation with someone else is in progress. When calling the range, avoid all but emergency calls at 15 minutes to the hour and 15 minutes past the hour so that you will not interfere with scheduled weather broadcasts.

The modern aircraft makes a far better broadcasting

studio than the old-fashioned, open-cockpit airplane. The quieting down of aircraft cabins and the use of higher frequencies have greatly improved aircraft communications but they have not eliminated all outside noises that tend to creep into the microphone when you are transmitting. Holding the microphone so that it actually touches the lips will help to exclude outside noises and materially enhance the quality of your transmission. Where signal transmission is clear, there is no necessity for repeating all landing, taxiing, and take-off instructions. Such repetition merely ties up the "party line." However, if part of the message is garbled, or if there is reason to question the instructions, such as the runway assigned, the questionable part of the message should be repeated in acknowledging the instructions. This will give the tower opportunity to correct any misinterpretation of the message.

All IFR (Instrument Flight Rules) clearances should be repeated because they are more complicated and must be written down when received.

The primary function of Approach Control is to direct traffic making IFR approaches. They are addressed as "(Portland) APPROACH CONTROL," etc. When communicating with Approach Control, you are actually talking to tower personnel. Only airports having considerable instrument traffic have Approach Control. At other airports, the range station gives all clearances for descents and clears the aircraft to the tower for actual landing instructions.

Approach Control transmits on all published tower transmitting frequencies plus the Low Frequency range. The latter permits IFR approaches with one receiver only —tuned to the LF range for both range signals and approach instructions.

It is not necessary to exaggerate pronunciations but each word should be distinctly spoken. A natural speaking voice should be used when making complete sentences. Knowing and phrasing the message before depressing the mike button will eliminate false starts and those "ers" and "uhs." The voice should be raised somewhat above the normal level so that the message will be louder than the external noises that will inevitably filter into the microphone.

The following standard phraseologies are used because they are concise and are readable under adverse operating conditions:

ACKNOWLEDGE	Let me know that message is received and understood.
AFFIRMATIVE	Yes.
GO AHEAD	Proceed with your message.
NEGATIVE	That is not correct.
OUT	Transmission ended, no reply expected. (*Do not say, "OVER AND OUT"*)
OVER	Transmission ended, reply expected. (*Do not say, "OVER AND OUT"*)
ROGER	Transmission received and understood. (*Does not mean "Yes"*)
SAY AGAIN	Repeat.
STAND BY	Guard or listen to this same frequency
WILCO	Will comply with your instruction
WORDS TWICE	Used when reception is difficult and it becomes necessary to have a message spoken more than once.

Know your radio equipment. You may have any combination of the following transmitting and receiving equipment. *There is no necessary relation between your transmitter and receiver.* One might be LF (Low Frequency) and the other VHF (Very High Frequency) or they might both be LF or both VHF. You might even have all of the equipment listed below:

TRANSMITTERS	*RECEIVERS*
LF 3023.5 kc.	LF 200 to 400 kc.
and/or	or
VHF 121.5 thru 122.8 mc.	LF 200 to 1750 kc.
	and/or
	VHF 108.1 thru 152.0 mc.
	and/or
	VHF 75 mc. (Marker beacon receiver)

Now for those complicated frequencies. We're ready to admit that aircraft radio frequencies have been subject to numerous additions and changes in the last few years so that even many old timers have gotten lost among the current frequencies. The only way (*Continued on page 48*)

TROUBLE SHOOTING YOUR AIRCRAFT RADIO

If a call to the tower produces no reply, the following procedures should be used.

1
Check transmitter selector switch (On Tower).

2
Check receiver correctly tuned to frequency on which reply was requested.

3
Check filter selector switch on BOTH or VOICE.

4
Check microphone and headset connections.

5
Check radio fuse.

6
Repeat call and wait a reasonable interval. Your signal may have been blocked out by someone else calling.

7
Check filter on BOTH. If receiving VHF, tune to omnirange to see if receiver is working. If receiving on low frequency, tune to LF range for this purpose.

8
If receiver operates on range station, select correct transmitting frequency and call range station and ask for a radio check. If there is no reply, your transmitter is probably inoperative.

9
If the range station reports your transmission is normal, tell them the tower frequency you are trying to receive and they will alert the tower for you or advise you of another frequency to listen on.

Sometimes it is not your equipment that is inoperative but the tower's or the range station's equipment. They have maintenance problems also.

Left: Tricky air currents and rugged terrain challenge the pilot at Indian Creek landing strip in the heart of Idaho primitive area.

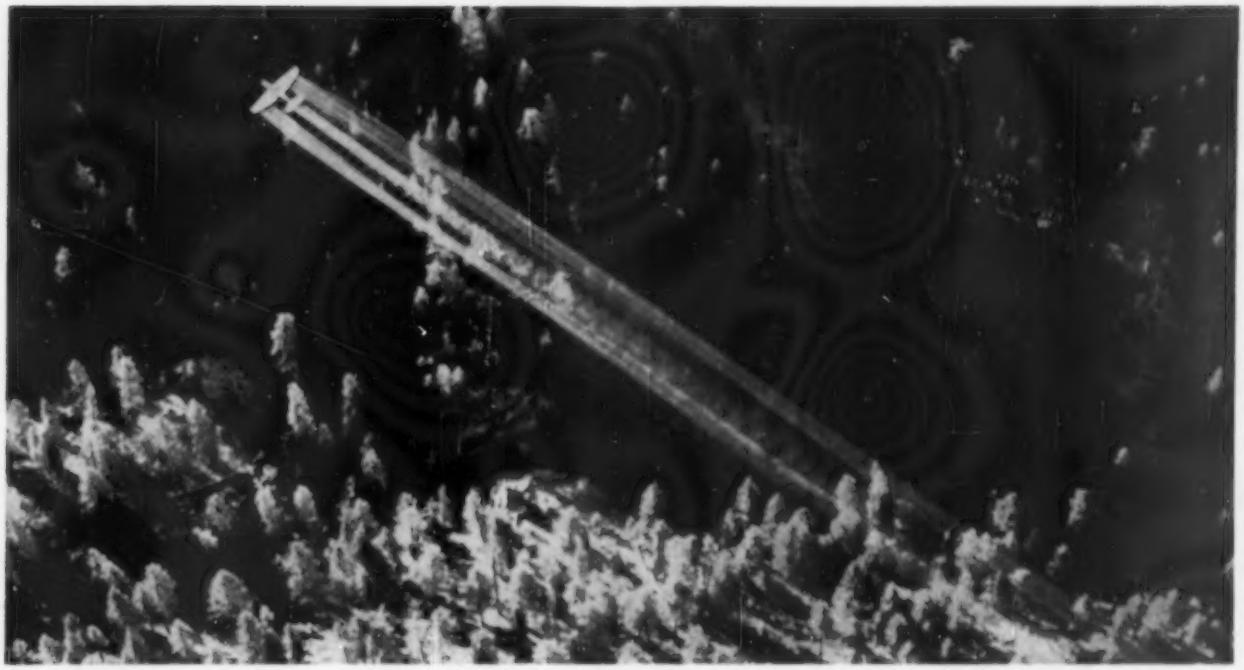
Right: Chet Moulton, Director, Idaho State Dept. of Aeronautics.

Aviation has had a tremendous impact upon the way of life in "The Gem State."

By EVAN FOSTER

The Idaho Story

Below: Volunteers, using State equipment and tractors donated by local farmers, work on community airport project at Carey, Idaho.



Spreading a deadly spray pattern for a pine butterfly infestation in the Boise (Idaho) National Forest.

THE PLACE OF STATE government in the American air pattern was long controversial due to the interstate nature of air commerce and the question of the sovereignty of air space. However, with the matter of airworthiness standards and flight regulation settled in federal government, the way was opened for authentic contributions of various state administrations . . . promotion, local development, public education.

Numerous states, careful not to impose burdensome taxes, watchful against political intrusion in technical matters, and with an eye to serving the local citizen, have done highly praiseworthy jobs.

Among them is Idaho, where modern industry and extensive agriculture, forestry and mining are blended with primitive areas and the sparse population profits vastly from every means of communication and transportation which can be invoked.

Idaho's privately owned civil air fleet guards her cattle herds from starvation in occasional bitter winters; stamps out the fire in her vast mountain forests; fights back the devastating pests which consume crops and lumber; wings the back-country sick and injured to hospital and culturally contributes immeasurably to her way of life.

All of this is not accomplished without organization. The building of local airports, the laying down of wilderness airstrips, the airlifting of hay to starving cattle or game herds, the rescue of lost travelers, the organization of breakfast flights, the implementation of a state education program for teachers . . . somebody has to plan it all and drive it to action.

In Idaho's case, Chet Moulton, State Director of Aviation, is the focal individual. Taking over in 1946, Moulton has brought the number of airstrips from 90 to 215; laid down an unexcelled pattern of air markings; developed a special Idaho air map and airport directory; organized an aggressive Search and Rescue service and a splendid air education program.

With the trend to return more and more responsibility from the federal to state governments, the states face a new challenge in local air development. END

Idaho teachers, winners of Air Education contest, on an all expense paid vacation trip to Hollywood, Calif

Bill Boone, test pilot for Paul Mantz, in the cockpit of the WWI *Spad* fighter. Note the narrow and rigid but rugged landing gear

There's lots of excitement,

according to a well-known test pilot,

to be found in

Flying a World War I Spad

By LOUIS ALEXANDER

FREQUENTLY OVER THE PAST year a pilot has been taking off without tail wheel or brakes and with only a single electrical system in his plane. He could not see his instruments without ducking his head below the cowl. Reckless? Nope. He was doing this year only what every pilot a generation ago had to do. He was flying a World War I *Spad,* the most popular fighting plane of that generation, the F-86 of its time.

Imagine that you have been flying a modern plane in the 100-120 mph class, on a sunny weekend around your local airport. As you taxi up the ramp area, you note the *Spad* standing there. It's about the same size as the plane you have been flying. You ask the airport manager if you can take it up. Here's what it would be like, according to Bill Boone, Los Angeles, Calif., test pilot for Paul Mantz, or Walter Reid of Houston, Tex., World War I fighter jockey.

Let's start out with a formation takeoff, you flying the *Spad* in front and your friend following, for example, in a Cessna 140.

The *Spad* is off the ground about as fast as the Cessna, or any other modern light plane.

"The *Spad* has a fantastic angle of climb," says Bill Boone, "about 45-degrees, I would judge."

The Cessna doesn't climb as steeply or as fast. The *Spad* will be waiting up there at cruising altitude when the Cessna gets there. The *Spad's* ceiling, by the way (assuming good condition), is around 17,000 feet.

It's exciting, flying the *Spad!* In the open cockpit, the wind whips your face and it's bitter business in winter. You *know* you're flying. Let's throttle back to cruising speed, now, at a moderate altitude. The Cessna will be leading slightly, at 115 mph. "You've got to hold a little forward stick on the *Spad,* all the time," Col. Reid notes, though the compact biplane trims well for a climb.

The 28 gallons of fuel in the *Spad's* belly tank will last only an hour and 40 minutes. The Hispano-Suiza engine of World War I design eats up about 17 gallons an hour.

You can get the same cruise out of an 85 hp Cessna 140 at five or six gallons per hour. And it can stay up about five hours.

It's when you start maneuvering the planes that you'll notice the great difference 30 years have made. The *Spad* is a dainty little plane in configuration but the difference between its cruising and stalling speed is only 40 miles—110 cruise and about 70 stall. Rack the *Spad* up in a tight turn and you'd better hold your hat. It will whip off on you like lightning and without any more warning. The dog fighting over France, with all the turning and twisting of the saucy little *Spad* was highly unforgiving of anything less than high precision air work. Tight turns in the *Spad* were sheer art . . . or a spin. Your light plane of today without any particular pilot skill can turn inside the *Spad.*

Modern flyers agree that the airmen of a generation ago had to be really "hot" to rate as ordinary pilots—flying took more nerve, faster judgment, greater adventurousness. And remember they had no chutes, no navigational devices, no de-icing . . . no nothing.

Flying the *Spad* provides lots of excitement. The gas gauge is of the last-minute type. Most of the gas is situated in a belly tank just forward of the cockpit, handy for starting fires in the pilot's lap in case of a crash landing. A wind-driven pump raises the gas to a 2½ gallon tank located in the upper wing from whence it feeds by gravity into the engine. You can see the gas trickling through a small glass tube running through the cockpit between tanks. When you can't see gas trickling any more, you have ten minutes of flying time left! (*Continued on page* 66)

JayCee Annual Air Cruise

This extremely popular coast-to-coast mass flight promises to be even more enjoyable this year.

By JOSEPH VOLNEY

IF LONG PREPARATION and careful planning have anything to do with results, the Philadelphia JayCee Third Annual Transcontinental Air Cruise will set a new high mark for sheer fun.

Contrasting with previous cruises, this year's event will be flown from west to east, departing Palm Desert Air Park, Palm Springs, Calif., on June 18 and winding up at North Philadelphia Airport on June 25 with a final party. The route will run from Palm Desert to Philadelphia via Phoenix, Tucson, El Paso, Abilene, Tulsa, St. Louis, Columbus, and Pittsburgh, The cruise as heretofore will be flown under VFR conditions and in daylight hours.

Participants, making their separate ways to Palm Desert from various points across the country, will first assemble as a group on June 17 and become acquainted at a steak dinner and jamboree on the Palm Desert Airport. Next day around noon the cruise will launch out for Phoenix where the first overnight stay and en route party will be held.

Leaving Phoenix on the 19th, the planes will cruise to Tulsa where, on Monday, June 20, another festive occasion will introduce Oklahoma hospitality. From Tulsa, on the morning of June 21, the vacationers take off for Philadelphia with intermediate stops overnight to be made wherever the fancy of any pilot or group of pilots may indicate. Noon of the 25th is the deadline for reaching Philadelphia.

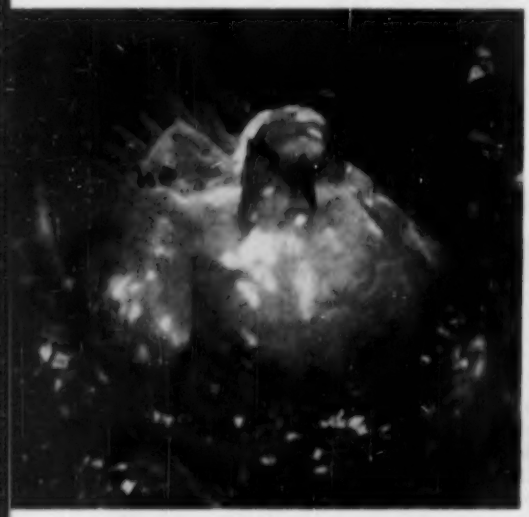
Popularity of the JayCee Cruise has increased steadily each year. Last year's event saw some 60 aircraft carrying some 200 vacationers. While the project is an efficiency event as far as pilots are concerned, and although there is plenty of competition among the various classes of aircraft represented, the cruise has more and more assumed the complexion of a fellowship tour and family vacation. The copious range of prizes to be won is overshadowed by the copious fun to be had by the riders. It is anticipated that more than 100 planes will participate in the 1955 event; and the fact is stresed that entrants need not be members of the Junior Chamber of Commerce to be heartily welcomed. The young businessmen simply organize and run the cruise as a medium of the Chamber's enthusiasm for personal flying and as an inducement for the families and friends of airmen to take a novel vacation. It is the ambition of the JayCees eventually to have some participants from every state and territory in the Union.

As far as the efficiency phase of the project is concerned, the handicap system this year will assign a more realistic normal cruising speed. The lighter and slower planes will be given a more equal opportunity to win top prizes than heretofore. The organizing committee has compiled all rules and pertinent data in a handy booklet to replace the bulky instruction sheets of other years. Likewise a package of various folders, application blanks and general information has been prepared for mailing to interested applicants.

It is suggested that pilots and their families or friends who may contemplate making the cruise, send for information kits immediately. Take-off positions will be assigned in the order in which applications are received. Entries may be submitted from anytime after midnight of March 1 to the deadline of May 15th . . . unless a maximum number of 200 entries is reached before that date. The Committee is not prepared to handle more than this number of aircraft in the 1955 project.

All communications should be addressed to the Philadelphia Junior Chamber of Commerce, 17th & Sansom Streets, Philadelphia 3, Penna. END

Above: (Left) A Booby, which can dive into ocean from a height of 100 feet. (Right) Young Black Gooney in typical pose



Above: (Left) Bosun-Bird, which cannot walk but flies backward. Note fledgling under parent bird's wing. (Right) Group of Frigate birds. They are masters of the art of soaring and playing the pirate, robbing other birds of their fish catches.

The real pioneers of flight are the birds.
The great airplanes of today are deeply indebted to

DESIGN IN NATURE

By WELDON D. WOODSON

A HOST OF MAN'S inventions were inspired by mother nature. The airplane is a vivid example. In the gay nineties, Otto Lilienthal, father of modern flight, made more than 2,000 sorties on wings fashioned after those of the hawk.

Evolving a film, "The Prior Claim," depicting the influence of nature on human invention, Moody Institute of Science in West Los Angeles, a department of the famed Chicago institution, trekked to Midway Islands for the parallel between the birds and the planes. Midway is home base for the world's most interesting squadrons of sea birds.

Lying about equidistant between the Orient and the American mainland, the tiny islands were appropriately named . . Midway. Originally scant of vegetation, the glaring coral sands are now relieved by ironwood trees and by cultivation of the native Scaevola shrub. The U. S. Navy, the Commercial Pacific Cable Co. and Pan American Airways have cooperated to this end.

The birds of Midway have witnessed manifold human cruelties. The plumage trade almost caused their an-

Above: Renowned for its grace and beauty is the Fairy Tern which lays its egg in such places as a bare branch or in the crotch of a limb. Right: Less than two-day-old Fairy Tern threatens photographer

nihilation. Authorities once caught a party of poachers with the ornamental feathers of a quarter million birds. Another band of poachers herded birds into a dry cistern to starve, thus reducing the layer of fat so that the task of cleaning the skin would be easier. But today the birds are carefully protected by government.

Midway provides habitation for birds whose behavior and appearance often differ from those native to the States. There is the Gooney Bird, agile at dancing; the Sooty Tern, apt at screams that deafen the ears; the Fairy Tern, recipient of such descriptive terms as "ethereal," "charming," the Bosun-Bird, unable to walk but skilled at flying backwards; the Booby, conceived of as stupid; the Moaning Bird, whose yowls would serve as sound effects for a ghost story; the Frigate, pirate of the air and master of flight. All of these got the nod from Director Dr. Irwin A. Moon to co-star in the "Prior Claim."

The Institute's Associate Director, Alton Everest, explains that the name Gooney, from the English dialect, *Gony*, meaning simpleton, is applied to two of the albatrosses: (1) the black-footed Albatross (*Diomedea*

nigripes), or Black Gooney, dark brown above and somewhat lighter below. (2) the Laysan Albatross (*D. immutabilis*), or White Gooney, snow-white breast, but blackish brown on the back and wings. As large as a goose, these birds have a wingspread averaging about seven feet.

In the air, the Gooney gracefully soars or swoops to drag a wing tip across the top of a wave. For such a heavy bird to get in the air, especially in gentle winds, it must run with outspread wings until a speed of about 25 mph has been attained. For take-off, the modern Gooney has appropriated roads and airstrips. That's not so gooney!

The dove-size Sooty Tern, if one were to judge solely by numbers and noise, would easily be the outstanding bird on the islands. With snow-white breast and neck, sooty back and top of the head, and armed with a long and pointed beak, the Sooty Tern congregates an estimated half million strong in an approximately 20-acre area. The Hawaiians call this bird Ewaewa, which means "to make one uncomfortable," and refers to its devastating screech. It has long, pointed, swept-back wings and forked tail. A common sight is that of two Sooty Terns flying wing-tip to wing-tip across the island at break-neck speed.

Its cousin, the Fairy Tern (*Gygis alba*), earned a role in "The Prior Claim" partly because it qualifies as a superb flier, but also on account of its singular nesting habits. The Fairy Tern goes under other common names, such as the Love Tern, Japanese Love Bird, White Tern. Depicted in superlative phraseology for its beauty and grace, it has snow-white plumage, brilliant black "shoe button" eyes ringed in black, and a black bill which becomes bluish at the base. It issues a plaintive, melodious cry as it flutters about one's head.

At Midway it lives principally around the ironwood groves, nesting on the limbs. It lays its eggs on a bare limb in an indentation the human eye could scarce detect, or in the crotch of a tree or bush, or on the top of a fence post, or between two parallel limbs, barely kept from falling through by the slightly greater diameter of the egg.

To sit on a carefully balanced egg without tipping it off, the prospective parent gently touches it with the bill as a guide, and slowly and cautiously pulls itself over it so that the soft breast feathers cover it. Scientists believe the precarious egg hatches under the feathers of the parent bird. Once hatched, the baby secures a grip on its perch so firm that it is practically impossible to lift one from the limb without pulling it apart. While asleep on a wind-blown limb, the youngling droops the head over one side and the tail over the other, its hold apparently tightening as it tends to roll.

The Bosun-Bird was christened so by sailors because, "it has a marlin-spike on its tail." It cannot walk but it can fly backward. It cannot stand on its legs and is always seen in a crouching position while on the ground. In taking off, there is a sudden flurry of wings and up it goes like a helicopter, with raucous accompaniment of all-out vocal efforts, and a subsequent gliding dive. The bird then hauls back on the stick and pulling into a stall, flies backwards with its two long scarlet tail-feathers streaming out in front. It appears that the wind assists in the backward component of the flight, but authorities have stated that it goes on unabated in a dead calm. Another "Show Business" family of "The Prior Claim" is the family of Boobies or Gannets, which comprise three species: Red-footed Booby, Brown Booby and Blue-faced Booby. They are large, long-winged sea birds with sturdy, conical beaks, very short, stubby legs and long, wedge-shaped tails. "Gannet" and "Booby" are used more or less interchangeably, the latter name being given by early sailors because of the apparent stupidity of the birds. When they land they can be picked up without trying to fly away, although they will probably try stabbing the intruder with their sharp beaks. The Booby excels as a diver, plunging under water to a depth of 90 feet from the height of a mere 100 feet. Not satisfied with just diving upon a fish, the Booby pursues it under water, swimming at top speed.

Still another prominent resident on the islands is the Moaning Bird. Actually, there are two kinds: the small one or Bonin Island Petrel (*Pterodroma hypoleuca*), noted for its great numbers—an estimated 500,000 on Midway Islands alone; the big one or Wedge-tailed Shearwater (*Puffinus pacificus*), which Hawaiians refer to as the Uau Kani, or Noisy Uau. The dominant trait is the ghoulish noises they put out.

Finally, the Frigate Bird, "greatest master of flight among all birds," can snatch a fish from below the surface of the sea so stealthily that the school of fish is not even disturbed. Also it likes to fly at considerable altitude, spot a baby Tern or a flying fish on the wing, and power-dive to the catch. Thereupon it tosses the victim into the air and recatches it, to line things up for an easier swallow.

"But doing things the legal and socially accepted way is not one of the strong points of the Frigate Bird," the Institute emphasizes. "Why not allow the other birds to do the heavy work, and intimidate them to give up their food?" Here the Booby is most often victimized. Soaring gracefully, the Frigate carefully watches for the Booby to come in from the sea with a cropful of fish.

The Frigate gives chase, and the Booby disgorges to lighten himself for escape. The Frigate dives to recover the loot which rarely has time to hit the water.

In the air, this pirate expends scant effort in keeping aloft as must so many other birds. A group in flight heads into the wind, sailing from side to side without progressing, long forked tails opening and closing, and heads moving from side to side. They hover hour after hour, day after day, but return to their nests at night.

The Frigate's superiority over others as an aerial performer is due to superb design for this function. Robert Cushman Murphy, one of the truly great students of sea birds, cites a Caribbean specimen with an 89-inch wing spread and a weight of only 12 pounds, 2.5 ounces. When dried, its entire skeleton weighed merely one-quarter pound. The breast muscles which propel the wings comprise a fourth of the whole weight of the bird: and the feathers another fourth. Compared with sea birds of the same weight, the Frigate has 40 per cent more wing area. Strong muscles are of value only if strongly attached to a sturdy frame. The Frigate bird has special provision for this, the wishbone being fastened to the keel of the breastbone and to the two lateral stanchions of the shoulder girdle.

"The sea birds of Midway Islands go about their established pattern of life without paying too much attention to the noisy, mechanical birds which come and go," sums up Moody Institute of Science. "To the thoughtful observer, however, a giant transport roaring down the runway is deeply in debt to the bird scurrying out of its way. The one is so great and powerful; the other is so small and delicate, yet the former is debtor to the latter." END

YOU AND INSTRUMENTS

BY

COL. JOSEPH B DUCKWORTH, USAF, RET.

FOREWORD BY

FRED B. LEE, ADMINISTRATOR OF CIVIL AERONAUTICS

"No ingredient of aviation is so important as the airmanship of the pilot."

GILL ROBB WILSON
Editor and Publisher
FLYING *Magazine*

FOREWORD

I FIRST MET Col. Joe Duckworth in 1942 when he was in charge of flight training at the Columbus Army Air Base in Mississippi, and I was a Navy officer detailed to the newly formed Instrument Flight Instructors' School at Atlanta, Ga.

At that time, operational losses in Army Air Forces and Naval aviation had reached such proportions as to cause serious concern in both Services. We in Atlanta and Col. Duckworth in Columbus, were independently working on development of new techniques in instrument flight in an attempt to make military aviation a safe, all-weather operation. We learned about each other's activities and I had the personal pleasure of working with him, obtaining his sound criticism of our plans and, in turn, reviewing what the Army was doing through him.

COL. JOSEPH B. DUCKWORTH, USAF, Ret.

Col. Duckworth was able to translate his years of experience as an instructor and airline captain into a valuable asset for the AAF Training Command. Everything he proposed indicated his extensive knowledge of the subject. When Gen. "Hap" Arnold visited Columbus to review the progress that had been made, he was most impressed and pleased with the work for which Col. Duckworth was responsible. This I know from personal conversation with Gen. Arnold at that time. Within two months after Gen. Arnold's visit, the Instrument Instructors' School was formed at Bryan, Tex., and Col. Duckworth was placed in command of what proved to be a most successful and valuable operation.

Soon thereafter, Col. Duckworth became Commander of the AAF Instrument Flying Training Wing with headquarters at Bryan, and a second instrument instructor school was activated at Lubbock, Tex., under his supervision. Graduates of these schools were sent far and wide, forming the nucleus of the all-weather activities of the Air Force and, in turn, indoctrinating countless thousands of other Air Force pilots.

Since the War, Col. Duckworth's varied operational experience has made it possible for him continually to follow closely the subject he loved so well—as Director of the Safety Bureau of the Civil Aeronautics Board and, when back in uniform, as Vice-Deputy Commander, MATS, and later as Commanding Officer of Hickam Field, Honolulu. But most pertinent is that, since his retirement in 1952, he has continued his flying activities in his own lightplane. As a result of this experience, he has come to recognize so clearly the peculiar needs of the lightplane pilot.

I know of no one better qualified on the subject of "instrument flight," both from the standpoint of personal knowledge and of years of experience in instruction in this subject. In the following pages he has cut out the non-essentials and has simplified the techniques to a point where they can become a part of the skill of every cross-country pilot.

BY F. B. LEE

Administrator of Civil Aeronautics

INTRODUCTION

AN AIRCRAFT IS NEVER SO SAFE—nor so useless—as when on the ground. Aloft, it can be the safest, or the most hazardous, means of transportation known to man.

Both hazard and usefulness almost wholly depend on the skill and judgment of the pilot. Particularly is this true when weather conditions require flight by instruments. The competent instrument pilot, with adequate equipment, can utilize his aircraft safely in practically any en route weather, and under all but the worst terminal weather. It's being done every day.

Almost the reverse is true of the pilot who knows little or nothing of instrument flying. Actually, he is unsafe under a wide variety of flight conditions and, even with the finest equipment, he cannot afford the hazard of being "caught" on instruments. Yet careful as he may be, sooner or later he may find himself in such a situation.

Many private pilots face this dilemma without realizing its potential seriousness. Ostrich-like, they think to avoid the evil day by firmly declaring they "never intend to get caught." But they say there is a place paved with good intentions and I have no reason to doubt it.

Such pilots do not realize that it is a simple matter to prepare themselves for safe escape from the majority of unsought instrument situations. The skill and judgment required for intentional precision instrument flight are not required. What is required is willingness to recognize the nature of the problem and to devote about five hours of self-instruction to mastering essentials.

Of course, no amount of acquired skill will overcome a pilot's loss of *self control*. Panic or "freezing" probably spells disaster—contact or instrument. But confidence gained through self-instruction will reduce that possibility.

The sole objective of this work is to present in simple form the minimum sound information necessary to enable the non-instrument pilot to acquire that ability for himself. Only thus will he be able, when he finds himself "on instruments", to save himself and others. Only then can he justify his proud title of "Pilot."

The author's problem has not been *what* to include in these articles, but how *much* to include. No decision had to be made on what principles, procedures and techniques are sound and workable; these have been known and proven for many years.

You have only to understand them and by self-effort put them into practice. Whether you do so is your choice, alone. I can but assure you that, some day when the chips are down, you will recall your wisdom or folly.

CHAPTER I

The Problem

BEFORE WE GET into the meat of this subject let's kick it around a bit. Let's define the problem; particularly as it differs from the requirements of the professional civil or military pilot.

Prior to 1930, there was no such thing as intentional instrument flying. There was an evident requirement but necessary instruments were not available and training was practically non-existent. During the next 15 years, the civil and military utility required of aircraft, to say nothing of safety demands, forced professional pilots to develop and master precision navigation.

For the professional, the airplane must be a safe and effective means of transportation, whether the cargo is bombs, bullets or people. Modern operations require precision use of instruments—as well as radio and radar—under *both* instrument and "semi-contact" weather conditions. In most operations, the professional pilot is safe and effective almost in direct proportion to his skill and judgment in instrument flying and radio navigation. Problems of weather, flight planning, communication and traffic control—to say nothing of possible in-flight mechanical emergencies—add to an already critical task of smooth precision control of his aircraft by instrument reference. A well executed "tight" low approach is the classic example. The very fact that it is done routinely by the professional, marks the most significant development of aviation in recent years. Both safety and usefulness have been achieved to a high degree.

At first glance, it seems odd that this great development has had so little effect on training requirements for the private pilot. Just because it is impractical to train to the degree required of the expert, cannot mean that the private pilot should have *no* training in ability to control his aircraft in a chance brush with instrument conditions. Of course, the average pilot who flies only for pleasure or convenience can ill afford the extensive instrument and radio equipment necessary for intentional instrument flying. It's equally true that, with little or no training, he wouldn't be able to use them anyway. Yet there is no reason why he cannot learn, with a minimum of equipment and effort, to control his airplane by instrument reference alone—*in an unsought emergency.*

Without any training, the average private pilot caught on instruments is in about as helpless and dangerous a position as it is possible to imagine. If visibilities or ceilings are low, he may spiral into the ground before

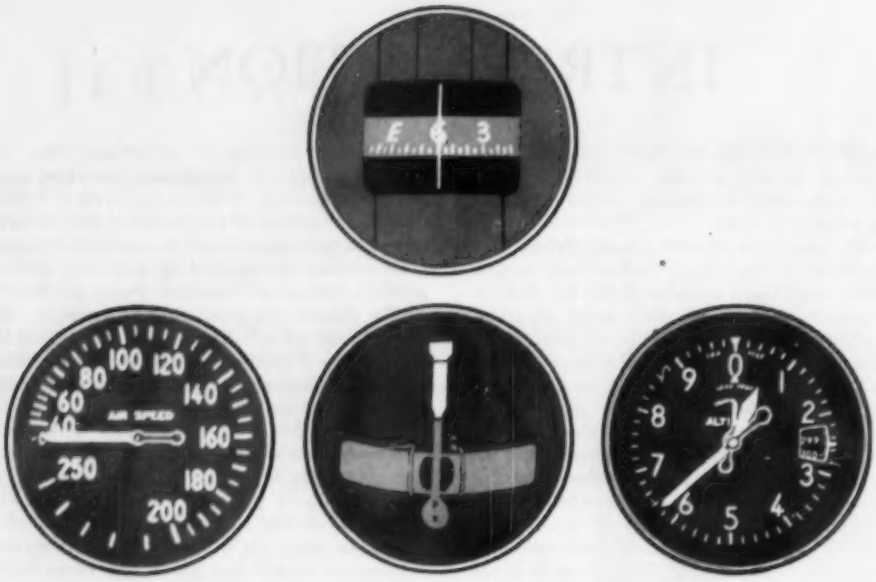


FIG. 1. THE PRIMARY PANEL.

he can regain control of his aircraft by visual reference —the only means of control he knows. Even if "ground" ceilings and visibilities are fully "contact", he may cause a structural failure before he can regain control visually. If you don't believe it happens, take a look at the official accident reports of the Civil Aeronautics Board.

Very few pilots intend such folly and, with extreme care and greatly restricted use of your airplane, you may never get into such a situation. But it's possible and, if you fly long enough or far enough, it's quite probable. The chances are that you yourself have "come close" at some time or another.

The nub of the problem is that, if *both* the professional and the "contact only" pilot need to know anything, it is how to *control the aircraft by instrument reference*. The fact that one needs it routinely, and the other needs it in emergency only, is begging the question. True, the professional needs *precision* control—the uninitiated needs only *positive control*. The first can only be had with expensive equipment and long training and practice. The second, when used as an emergency procedure only, needs only a simple *turn indicator, airspeed meter, sensitive altimeter* and *magnetic compass* (Fig. 1). And this training, which may save your life some day, requires only about five hours of serious self-instruction and practice.

Right here, let me say that safety is a relative thing. No amount of equipment or skill prevents all accidents—professionals suffer them too. But just because there are no guaranteed solutions, is no reason to ignore the problem, particularly when so little effort is involved. Too many private pilots have thrown up their hands and said they "wouldn't be caught dead on instruments"—only to be caught *very* dead.

The problem of the pilot who knows little or nothing of instrument flying is neither difficult to recognize nor solve reasonably. First, he must realize the almost fatal hazard of being caught in emergency without ability to positively control his aircraft by instruments. Second, he must *learn* to control his aircraft solely by instrument reference, aganst the evil day when he may be caught. Third, he must recognize his self-acquired ability for what it is, purely an emergency procedure. Deliberate instrument flying is a project not to be attempted by other than the trained and experienced expert with adequate equipment.

If you have the four instruments mentioned as essential, why not try a little experiment to see what is meant when we speak of *positive* control of the aircraft—or lack of it. Get another pilot to go up with you and, after trimming out the airplane, have him fly straight and level. Then ask him to let you place a bag over his head, and *then* to continue flying straight and level. He may do so for a few minutes. The longer he leaves the natural stability of the aircraft alone,—depending on trim and proper power setting—the longer the airplane will fly itself. But wait! Sooner or later, in a matter of minutes at best, he will end up in some unusual position, probably a diving spiral.

". . . some unusual position, probably a diving spiral."

That's exactly what happens to you when you get caught on instruments. Having no means of determining the airplane's attitude* (remember, the instruments mean nothing to you yet) and being totally unable to rely on your physiological sensations, it is *impossible* to control the aircraft. The result is that the airplane eventually flies into the ground in a diving spiral, with or without the wings or tail group. Add the factor of tenseness, over-control, or "panic" and the result is quicker and more certain.

In the experiment cited above, you will, of course, take over the controls before the airspeed gets too high, or the ground too close. If, on the other hand, your "guinea pig" knows anything about instrument flight worth knowing, he could let you place a "hood" about his head (restricting his vision so he could see only the turn indicator, sensitive altimeter, airspeed and compass—but *not* see

* Aircraft attitude is simply the angular cant of the wings and fuselage (nose) to the true horizon. See Fig. 2.

outside the aircraft) and safely control the aircraft in straight flight, climbs, and descents, turns to approximate compass headings and even recoveries from unusual positions! Conversely, if your guinea pig knows little or nothing about instrument flight, all the instruments in the world would not permit him to control the aircraft in these maneuvers when he couldn't see ground or horizon.

The gulf is that wide. You either can do it with only four instruments, or you can't do it with a panel full of them.

The best part of it all is that there's nothing mysterious about learning positive control of an aircraft on instruments—you can do it—anybody can do it. There is a vast difference, of course, in becoming a precision instrument pilot. But here we are speaking of *positive control in emergencies only*. All you need are the facts, an airplane with four instruments, and a willingness to apply yourself.

If every pilot could safely control his aircraft on instruments, it still would not solve the whole "weather" accident picture. But it would certainly give the airman a far better chance in emergencies than he possesses without that ability. One reason it is inconclusive is that, though it builds confidence, no technique can conquer or prevent fear. *Self control is as necessary as aircraft control.* Airplanes do not yet have "panic buttons" to automatically get you out of trouble.

In any situation, fear is man's worst enemy. Many men literally live in fear. Certainly, all of us are afraid at one time or another. And you can bet that the first time you encounter actual instruments will be one of them. Pilots who dispute this have either no regard for the facts or are very forgetful.

As it is chiefly our unfamiliarity with weather which engenders fear, it would be a great help if, in addition to acquiring the necessary technique, you could get some experience as co-pilot on instruments. Even then, we must remember that weather does not *cause* accidents. I challenge you to find any accident where it can be honestly and categorically proven that the "weather took the airplane apart—the pilot did not have a chance." Structural or mechanical defects of equipment, unreasoning fear—or lack of control technique, perhaps—but not the weather *per se*. Weather can, of course, be a *contributing factor*.

Fear in such situations can cause the pilot to freeze or to panic, at best to overcontrol or to miscontrol the aircraft. When this happens, he literally *fails* to control his aircraft and can do nothing but wait for the ax to fall.

How do you conquer this fear hazard? There is no formula really, other than your own personal one. But you might begin by not being *afraid* to *be* afraid. Tell yourself you're scared silly; a good frank admission of it is healthy. Once having admitted it to yourself, you free yourself to get busy doing something about it. After all, you didn't deliberately place yourself in such a situation, I hope—but it sure is up to you to get yourself out of it.

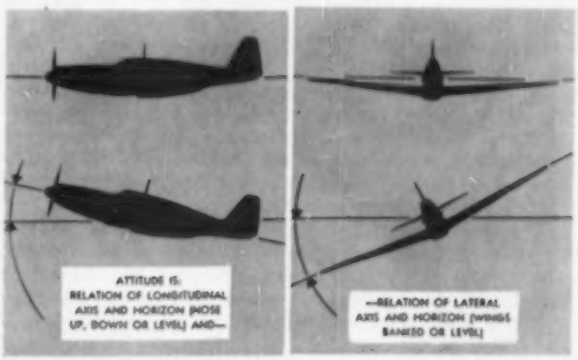
If you have learned your technique and procedures, you *can* do it. After all, the airplane flies no differently in cloud than in clear air. But success *is* dependent on your proper procedure and technique. If you haven't *got* it—you've *had* it!

As straight as I can put it, that's it. Your one hope is to have the proven-to-yourself ability to do the job when it is required. The airplane won't do it for you. A cockpit full of expensive instruments won't help either. It's whether you have the knowledge and ability to positively control the airplane, that counts.

But now you may have decided it will profit you to gain that knowledge and ability. If you haven't—goodbye—and forget it. But if you really want insurance that pays off in life instead of death, let's get at it. You may be pleasantly surprised how really easy it is.

You may also wonder why they didn't teach it to you instead of, "eights on a road!"

FIG. 2. ATTITUDE.


ATTITUDE IS:
RELATION OF LONGITUDINAL AXIS AND HORIZON (NOSE UP, DOWN OR LEVEL) AND—
—RELATION OF LATERAL AXIS AND HORIZON (WINGS BANKED OR LEVEL)

CHAPTER II

Positive Control

IN THE VAST MAJORITY of emergencies where the non-instrument pilot finds himself caught on instruments, his main hope lies in being able safely to reverse or change his course to a point where he can resume contact flight—or make an emergency landing by visual reference.

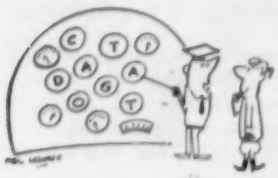
It is absurd to say that such an emergency maneuver requires him to be an expert instrument pilot. But it is equally absurd to say he has much chance of completing the maneuver if he cannot positively control his airplane by instrument reference. The sole purpose of these articles is to give you the necessary information to permit you to train yourself, in the shortest possible time, to do just that. Not by any "gimmick" or "system" but by sound and proven methods. The technique is old. Too many of us have overlooked the obvious, hoping for panacea.

In this presentation, professional techniques have been simplified into fewer and more "mechanical" means of aircraft control by instruments. Much that is not essen-

tial has been eliminated. "Positive" control, rather than "precision control" is our objective.

Let's begin by eliminating discussion of the skills needed by the expert in radio navigation, traffic control and instrument low approach systems. For such purposes, particularly low approaches, the expert must be able to control his aircraft with a high degree of smoothness and precision. I might add, this smoothness and precision is often underrated even by experts—but it's what separates the men from the boys.

In our objective of *positive* control, we can virtually dispense with precision control. It isn't essential to our task. This is important. It reduces our problem to simple proportions—to something you yourself can accomplish. There's simply no mystery about it, and you learn it step by step.



"For expert or novice, it's like a kid learning to read."

The first thing to remember is that an airplane flies no differently in cloud than in clear air. In clear air, the pilot *directly* visualizes the attitude of the nose and wings of his airplane in reference to the natural horizon. In cloud, we must *interpret* the airplane's attitude through symbols—the flight instruments. But both natural horizon and instruments are visual references—we are not flying "blind." Blind men cannot fly.

For expert or novice, it's like a kid learning to read. His symbols are words and sentences—ours are instruments. Words and sentences must be both interpreted alone and in their proper context. In reading instruments, we may term this ability "instrument interpretation" and "instrument coverage."

Here is the first way we simplify the experts' task for you. It is by limiting and defining the number of instruments to be interpreted. After learning to "interpret" them, of course, we learn sufficient "coverage." This gives us cues in proper context for positive (though not precision) control of the aircraft.

The second simplification is in the method of control by which you apply this minimum essential information. The expert—needing precision control of his aircraft in speed, altitude and direction—uses not only *more* instruments, but a more sensitive technique of aircraft control. Basically, he uses smooth coordinated use of stick and rudder to vary the aircraft's attitude to his "interpreted" horizon. In addition, he uses fine adjustments of power and trim for both convenience and precision. On top of all this, in critical maneuvers such as low approaches on instruments, he must know the exact position of his aircraft in altitude and direction. Let's see what these simplifications amount to specifically.

• ESSENTIAL FLIGHT INSTRUMENTS

Pilots who fly instruments intentionally and with precision require a "full panel" of flight instruments. Not only precision, but ease of instrument flight, is facilitated. In addition to our three basic flight instruments—turn indicator, airspeed and sensitive altimeter—they use artificial horizon, directional gyro and rate-of-climb. Additional navigational facilities are also employed, but these are not instruments generally used for control of the airplane.

It may be that your airplane is equipped with such additional instruments. In that case, you will eventually be able to superimpose the use of them on the procedures given here. But if you do, remember two things. First, you will be adding technique to procedures; you must "interpret" and "cover" ("cross-check"), more instruments more rapidly. Second, for reliability you must ignore both artificial horizon and directional gyro in regaining lost control. I will admit they are key instruments in low approaches, and mighty convenient in turbulence. But including their usage in our "minimum safe procedures" would serve only to confuse the beginner in accomplishing his objective as rapidly as possible.

There is yet another flight instrument, the so-called "ball-bank indicator," which we can eliminate. This is because we seek mechanical procedures instead of technique. This instrument is in no sense a "bank" indicator. It only shows coordination between aileron and rudder in control of turns, and is utilized by all pilots solely for this purpose. It is not essential to positive aircraft control.

• CONTROL USAGE

Precision instrument pilots use aileron and rudder on instruments in the same manner as in contact flight. Turns are made with coordinated control. Use of aileron in banking is mandatory, particularly in heavy or fast aircraft, for even the smallest change of direction. As you progress in your instrument flying techniques beyond the scope of these articles, you will do the same thing: adding other instruments including the "ball-bank" to your flight instruments. Even then, the "ball-bank" can only be used as an indicator for coordination of controls.

Practically speaking, we may use three types of control movement which will cause the airplane to bank, and therefore turn. We may bank with aileron only. Sustained rudder pressure will also cause the airplane to bank (and therefore turn). Or, as normally, we can use both aileron and rudder as required for coordination.

For our purposes, we can practically eliminate the "coordinated" type of control. We seek only *positive* control, not smoothness and precision. Whether or not we "slip" or "skid" in turns is immaterial, as we will necessarily have sufficient airspeed at all times. Flight does not have to be smooth to be safe, except in situations where great precision is required.

So let's forget coordinated control to begin with and use either aileron or rudder alone to control banking, and therefore turning. You may experiment on your own aircraft and use the control that suits you best, according to the situation. Nevertheless, it is recommended that rudder alone be used in small and slow aircraft—and aileron alone only in heavier or faster aircraft. No fixed rule can be given—but adopt *one* method and stick to it at first.

You will find that, for normal situations, use of rudder alone gives a rougher, but more positive type of control. Particularly is this true at slow speeds and in turbulent air. On the other hand, in heavy aircraft, or when the air is smooth and speeds are high, control with aileron is smoother and more positive. Argument may be had interminably on this subject—but in order to simplify our problem and make for more mechanical procedures, the methods of control outlined in these articles will speak only of use of rudder in controlling banking and turning. And it should be remembered that attempts at coordinated control can be very confusing. Do not attempt it in an emergency. Stick to the more mechanical, simplified use of one control—the rudder. We want to hold to one method of control at first.

• COMBINATIONS OF BANK AND PITCH CONTROL

The expert instrument pilot often uses combinations of bank and pitch control to advantage, as in climbing and descending turns. When he does, it requires a compli-

cated, coordinated type of control, and lack of good technique can result in hatching dangerous situations. In our goal, such maneuvers are not necessary, and are to be avoided. As an example, it is easier to climb or descend in straight flight and concentrate on pitch attitude control, than to attempt a turn at the same time. Conversely, maintaining small limits of pitch attitude in a gentle level turn is easier than attempting a climb or descent at the same time. We, therefore, seek to eliminate combinations of bank and pitch control as much as possible.

• USE OF POWER CHANGES

The precision instrument pilot uses frequent changes of power, combined with changes of attitude, in many maneuvers. For our purpose again, such techniques are seldom necessary, nor are they easy to master. It can be very distracting to continually think of and adjust power settings while maintaining essential attitude control by instrument reference. This being true, remember to change power settings *only* when you are in complete control of the situation. After all, you *can* climb with a cruising power, or descend with power off. Naturally it is advantageous if you can remember a few basic settings —to be used as the occasion demands—and *providing* you have your airplane under absolute control. They are:

1. A cruising power giving about 10 per cent less airspeed than normal cruise.
2. Climbing power.
3. Descending power (power descent).
4. Throttle off. (Recovery from high speed, unusual positions only.)

Since distraction from the basic task of controlling the airplane's attitude is dangerous and never desirable on instruments, remembering these settings for your particular airplane will be a big help. Set your power to them when you deem it necessary and leave them there until time to change them. They do not have to be exact. As a matter of fact, you *could* use only cruising power and still accomplish your objective.

Cruising power is given as slightly less than normal—a power setting which gives about ten per cent less airspeed than in normal cruise. There are two reasons for such a setting. The first is that less structural strain will result from excessive turbulence. The second is that it saves fuel. Be careful, however, not to slow the airplane down too much. An airspeed higher than the "optimum" for turbulent air is your best bet. You may need it.

Climbing power is also dependent on the particular aircraft plus, of course, the urgency of the situation. Almost any setting between that of a normal cruising power and full power is acceptable.

Descending power setting should give a rate of descent of not more than 500 feet per minute; preferably nearer 300 feet per minute. Again, this will depend on your particular airplane. As a general rule, a slow rate of descent, combined with better control resulting from adequate power, is desirable.

Do not get in the habit of distracting your attention from the flight instruments by attempting small tachometer and/or manifold pressure settings. Only an occasional glance at recorded power settings is permissible. If you are concentrating on control of attitude, don't attempt too many power changes. Attitude control comes first at all times.

• PROPELLER PITCH CONTROL

Changes of propeller pitch are also dependent on the type of equipment you have and the particular situation that exists. As a general rule, use one setting and leave it alone. The main thing to avoid at all costs is overspeeding should you get into a steep power dive.

• USE OF TRIM TABS

Wherever possible—*leave trim alone* at the cruising power setting. Unless your airplane is very heavy or fast, constantly attempting to trim the airplane is very difficult, even for the best instrument pilots. For the pilot flying lighter aircraft, it is not only a difficult technique, but can be distracting *and* confusing. It is, therefore, disregarded where reasonable control pressures can be used to overcome adverse trim.

• SELF-INSTRUCTION AND PRACTICE

Finally, we simplify the learning process through advocating *serious* self-instruction and practice. All the information necessary to instruct yourself is in this book and you will avoid individual "systems" or "ideas" which can be unsound, or at best confusing. The confidence and satisfaction you will gain from serious self-instruction and practice in sound techniques and procedures will be invaluable.

". . . serious self-instruction . . ."

There are two distinct steps we shall learn separately and consecutively. They are:

1. Control of bank attitude (turning).
2. Control of pitch attitude.

Once these two steps are mastered, you will be equipped to positively control your airplane by instrument reference alone while you seek contact conditions. You'll be the boss of the airplane, rather than having it take *you* for a ride.

There are other principles and procedures you will want to know in addition to this bare technique. These will be given you next month in the second half of this treatise. In the meantime, let's seriously practice these two simple techniques.

CHAPTER III

Bank (and Turn) Control

THERE IS AN ALMOST invariable pattern to fatal accidents suffered by "non-instrument" pilots "caught" in instrument weather. It goes like this.

The pilot lets a wing drop and the aircraft starts a turn. Loss of the vertical component of lift allows the nose to drop and the aircraft picks up speed. The pilot "senses" the increase of speed and perhaps the loss of altitude, so he "horses back" on the stick. This tightens the turn. After that the end is near. He hits the ground in a high speed diving spiral, with or without a wing or

tail surface. Why, oh why should the poor fellow note and attempt to control speed—yet apparently ignore and fail to correct the turn?

Well, in the first place, he is used to looking at the air speed—but not the turn indicator; sometimes he doesn't even have a turn indicator. In the second place, he believes his physiological senses—not his instruments. His physiological senses are a kind of "built in Gremlin," a *wholly* erroneous and malicious turn indicator. Above all, he does not realize that *control of bank attitude*, and therefore turning, is *the* most important safety factor in instrument flight.

Here again, argument is pointless. Just say you wouldn't be caught dead without a turn indicator in your aircraft and you have a pregnant answer to any argument. This applies at any time there is restricted visibility, day and night. No self-respecting pilot should be without one, as *the* emergency instrument. But he must know how to use it when called upon.

• THE INSTRUMENT

The so called "turn-and-bank indicator" is, of course, only one of several types of instruments which indicate turn and/or bank. But for a basic instrument every pilot can afford and *rely* on in *all* situations, it is essential. If you don't have an engine suction system, a venturi-driven instrument is quite acceptable, as you won't be making instrument take-offs—I hope.

The name "turn-and-bank indicator" is really a misnomer. It implies that the vertical needle of the instrument indicates turn, and that the "ball-bank," as it is called, indicates bank or banking attitude. The vertical needle *does* indicate turn, *and thereby bank;* the amount of displacement of the needle from center indicating *rate* of turn, and thereby steepness of bank.* The "ball-bank," on the other hand, indicates aileron and rudder coordination only. It is wholly and simply a "slip and skid" indicator. Its usefulness is strictly limited to an indication of stick and rudder coordination and the "ball-bank" indicator must be disregarded for *any other* purpose. For our immediate purposes, you may want to paste a piece of tape over it, so it won't distract your attention.

Positive control of bank attitude, or turning, must be done in our case *solely* by reference to the turn needle. Period! In fact, there is no other instrument which can be used with complete reliability in recoveries from unusual positions. Consider it *both* as an angle of bank indicator and a rate-of-turn indicator. Of course, for any given airspeed, the greater the angle of bank, the greater the rate of turn. And in installing a turn indicator, have it on the panel as nearly in front of your line of sight as possible to avoid parallax error.

• CONTROL OF THE TURN INDICATOR—STRAIGHT FLIGHT

The average small airplane flown by the personal pilot does not have nearly the directional stability of larger and heavier aircraft. Control of straight flight and inadvertent turns is therefore more critical. Constant vigilance, and immediate and continuous control action to prevent the airplane "getting away from you," is a "must." Have your turn indicator placed near to, and between, your airspeed meter and sensitive altimeter, if possible (Fig. 3).

For our purposes, as has been previously explained, the rudder is used as the means of controlling the turn needle. As the needle moves off center, *opposite* rudder is applied to move it back to center. It is as simple as that. The whole problem is to keep a constant watch for turn needle movement. Though control of the turn needle is the most important control to be maintained positively at all costs, it is the simplest and easiest procedure you will have to learn. The instrument is read and interpreted directly and the control application is mechanical.

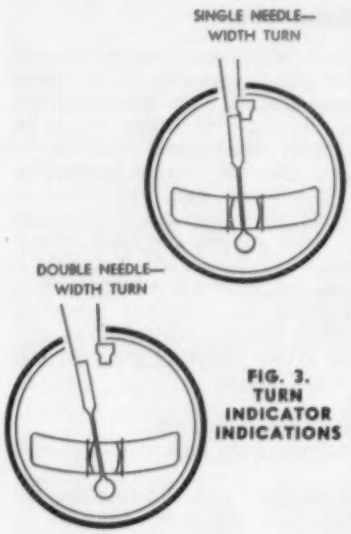


FIG. 3. TURN INDICATOR INDICATIONS

In rough air, the turn needle will oscillate, or fluctuate, in proportion to the roughness of the air and the directional stability of the aircraft. In such cases, it is often impossible to keep the needle exactly centered—but it *is* possible to "average" it about the center position. The needle must be kept on one side of center for the same *length* of time as on the other. Any *sustained* off center position to one particular side must not be permitted, if straight flight is desired. Keep the needle moving without hesitation from side to side across the center, so as to average its oscillations. In smooth air, this will not be necessary and the needle can be kept centered by rudder *pressures* instead of definite rudder movement.

Positive control of the turn needle with the rudder must be maintained to keep the needle centered or averaged. Never let the turn needle "wander off"—it is a direct, immediate indication to turning. Should rough air make it necessary, it is far better to be a little rough in your rudder control and thereby maintain immediate and positive control than to attempt smooth control. Overcontrol of the turn needle is not impossible but it is far less objectionable than overcontrol of the pitch attitude of the aircraft.

If temporary control of the turn needle has been lost—and the indication is extreme banking attitude, do not hesitate to use rudder, positively and continuously, until it is brought back to center and kept there. This would be an extreme case, of course, the whole point being never to let the needle get in such a position.

The most important single fact to remember in control-

* The airplane must bank to turn. The steeper the bank, the faster the rate of turn!

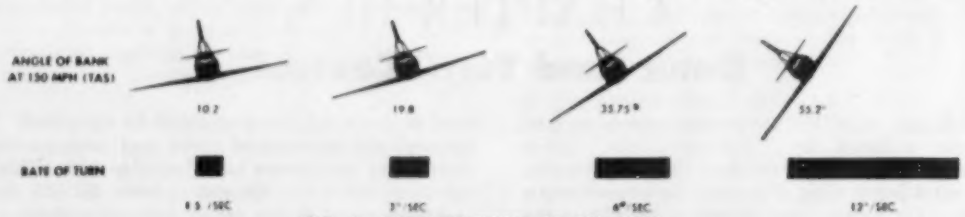


FIG. 4. RATE OF TURN AT 150 MPH.

ling bank attitude by use of the rudder in keeping the turn needle centered or averaged—is to keep *everlastingly* at it. Let it be your first thought at all times—do it immediately you encounter instrument conditions or when the horizon is inadequate. Never sacrifice it for pitch control or other actions—even if the engine quits. The chances of fatality are greatly reduced as long as straight flight is maintained. And remember that bank and turn are synonymous for our purposes.

As far as the technique is concerned, it is hoped you will learn not to overcontrol the turn needle, of course, and that you can develop smooth control. But neglect of it is far worse! As you practice the turn needle's control with the rudder under various rough and smooth air conditions, it will soon be apparent to you how much and how consistently control is needed. The rule here is that you should use the *minimum, but prompt positive and continuous* control needed to keep the needle centered, or at least averaged.

Now you understand, I hope, your first procedure and technique. Effectively utilized, you have in this one step, minimized your hazard tremendously. Do a little practice contact at first, maintaining your pitch attitude by the natural horizon while you control straight flight solely by reference to the turn needle.

• CONTROL OF TURNS

After your practice in keeping a fairly straight course, learn next to "center" the turn needle one half to one needle width *off to one side*. This will result in a shallow turn which can be maintained until you are ready to resume straight flight. There's not much to it—is there? Except in high speed aircraft, turn needles are calibrated to give a 3° per second *rate* of turn for each one needle width deflection (from center) of the turn indicator. The farther from center the turn needle is deflected, the greater the angle of bank (Fig. 4).

Steep angles of bank are not only undesirable and unnecessary; they are dangerous on instruments. The airplane can "get away from you." Control of attitude and speed becomes very difficult. Stresses on the airplane are higher. *Never* allow the turn needle to remain in excess of one needle width deflection from center. One half needle width is even better.

• PITCH ATTITUDE DURING TURNS

One of our objectives—and simplifications—was to avoid the necessity of simultaneously combining pitch and bank control. But both pitch and bank attitude must be controlled at all times, even though bank (turn) control may be considered as of first importance.

If turns are confined to level flight and the rate of turn, and therefore the angle of bank, is kept small—very little pitch attitude change will be necessary. This is why steep banks and turns are to be studiously avoided. Going *serially* from bank to pitch attitude control is far easier than trying to correct both at the same time. In the next chapter you will therefore learn pitch attitude control as a separate step, using different instruments.

• TURNS TO COMPASS HEADINGS

The Magnetic compass is a navigation instrument, not a flight instrument. It should never be used as an instrument indicating turn or bank. It is important that this be remembered at all times.

Actually, the magnetic compass should never be read unless the airplane has been in straight and level flight for a period long enough for the magnetic compass to "settle down." Turbulent air makes it even more difficult to read. Only occasional glances at the magnetic compass are permissible; the pilot should immediately return to the turn indicator for any *control* of bank, or turn. Never sacrifice control of the airplane to navigational purposes!

Nevertheless, as you progress in technique, you can learn to make turns to *approximate* compass headings, in order to fly out of weather. A set of simple rules will be given here which, if you desire, you can memorize as an aid. They are only valid at certain latitudes, such as in the United States. Remember them only as approximations, as it is always good policy for the beginner to "inch around" to a compass heading. Never concentrate on heading—concentrate on making an *estimated* amount of turn by reference to the turn indicator and, after flying straight and level, reread the compass to see how near you have come to the desired direction. A consistent successfully *controlled* turn, with a gentle bank, is all important. But if you do read the compass, you may find these rules helpful. *Don't* concentrate on them to the detriment of attitude control!

1. When turning to a heading of north, stop the turn 30° *before* the compass reads north (i.e. 330° or 30°, depending on whether turning right or left).
2. When turning to a heading of south, stop the turn 30° *after* the compass reads south (i.e. 150° or 210°, depending on whether turning left or right).
3. When turning to east or west, stop the turn when the compass reads the desired direction.

The foregoing rules are reductions to approximations and are given here only as a possible matter of convenience. Further and more final corrections may always be made when necessary. You will find the compass steadier and more easily read correctly in smooth air and on "southerly" headings. Remember there is plenty of time to get squared away on any heading, as long as the control of the airplane is not sacrificed. After the turn around, if you do not immediately find contact weather, fly longer than you think necessary, not risking a descent until you are more confident that you can break out into contact conditions.

Points to Remember

1. *Immediate and continuous* control of the airplane's bank attitude (turning) is the single most important safety factor in flight by instruments. Never sacrifice bank control under any circumstances. Watch carefully and continuously for any movement of the turn needle.
2. Bank control is read directly and instantaneously from the turn indicator. Have your turn indicator installed as nearly in front of your line of sight as possible—near to and between the airspeed and the sensitive altimeter, if you can.
3. Never allow the turn needle a sustained position off center for straight flight—or more than one needle width deviation from center in turns. One-half needle width in turns is sufficient. Use smooth, positive, immedjate and continuous control movement.
4. Pitch control must be maintained in straight flight and turns—but pitch control is much easier if turns are never combined with climbs or descents —and if only gentle banks are allowed.
5. Leave power and trim changes strictly alone in all turns.
6. The magnetic compass is not a flight instrument indicating aircraft attitude. Read it fleetingly and reliably only when squared away in straight flight. Never concentrate on it or allow it to distract your attention from the turn needle.

CHAPTER IV

Control of Pitch Attitude

TO ASSURE SAFE CONTROL of his aircraft in speed, altitude and direction, the precision instrument pilot practices smooth coordination of pitch attitude and bank attitude, combined with power and trim changes. This has been simplified for you by elimination of most power changes and all trim changes, and by elimination of stick and rudder coordination in turns. Furthermore, elimination of turning during appreciable changes of pitch attitude increases the simplicity of pitch and bank control. We have already seen that attempts by the beginner to vary speed and pitch attitude while turning usually aggravate the situation. The classic example is the tightening of inadvertent turns. Therefore, should it ever be necessary to make *large* pitch changes while turning—*stop the turn first.* This is, of course, another way of saying that bank and turn control are primary and essential to safe instrument flight and also that keeping them as separate as possible from pitch attitude changes makes for easier control.

Climbing and descending turns are not necessary to our purposes—leave them to the experts. With shallow level turns, only extremely small pitch changes will be necessary.

• INSTRUMENTS USED IN PITCH CONTROL

In our goal of control of the airplane in speed, altitude and direction, we directly and momentarily read the results of our efforts from the instruments as follows: direction from the magnetic compass—airspeed from the airspeed meter—and altitude from the sensitive altimeter. But we have already seen that, in order to *control* direction (straight flight and turns), we must be able to control the aircraft's *banking attitude.* We cannot use the magnetic compass. We must use an instrument which is steadier and which will indicate the amount of bank, or banking attitude. This instrument is, of course, the turn indicator.

In considering airspeed and altitude, we have the same problem of securing correct results through control of *pitch attitude.* Where do we get our indication of pitch attitude? Simply from the *trend,* or direction of movement at any one time, of the airspeed needle. Altitude, of course, is read directly from the altimeter but, in order to keep our ducks in a row, we want to think of pitch attitude only in connection with airspeed and the movement or trend of the airspeed needle. (There is one practical exception to this, but it is purely a "trick of the trade" which will be explained later.) Therefore, fix this principle firmly in mind—*we will control airspeed through control of pitch attitude, in the same manner as we control direction through control of bank attitude.* The only difference is that we will control pitch attitude through the *trend* (movement) of the airspeed needle, whereas we control bank through an *instantaneous* (direct) reading of the turn indicator.

Okay—but what about our *third* objective—altitude? Obviously you say, change of pitch attitude will also cause change of altitude. The answer is that it will but not always with the desired result. For example, in an approach to a power-off stall, we continue to *increase* our pitch attitude but the altitude remains constant, or decreases, as the stall is approached. As another example, if atmospheric conditions result in vertical gusts, which carry the airplane upward, we may *decrease* our pitch attitude, but the altitude increases. In *both* cases, however, our airspeed has responded *correctly* to pitch attitude variation.

The *surest* way to think of altitude control is by use of *power* changes. Admittedly, the effect of power changes are dependent on interaction with pitch changes—but remember we are after sound and simple concepts, not arguments about which comes first, the chicken or the egg. *Think of airspeed as controlled by pitch attitude changes and, conversely, that pitch attitude changes are indicated by trend (movement) of the airspeed needle.* Think of altitude as controlled by *power* changes but that, conversely, power changes are *only some times* indicated by altimeter needle trends (movements). These concepts will help you greatly in understanding the proper use of pitch control.

• INTERPRETATION OF PITCH ATTITUDE

Okay then. As a basic principle, we will control pitch attitude by reference to the airspeed needle. Since a momentary reading gives us only airspeed at that instant and, as we have no additional instrument showing pitch attitude directly (such as the artificial horizon), we must "read" or interpret pitch from the *trend of movement* of the airspeed needle. Perhaps an example will best illustrate why we must get our pitch attitude from the trend of movement rather than the "direct" type of reading we

FIG. 5. INDICATION OF ATTITUDE BY AIRSPEED INDICATOR.

Showing Level Flight (Proper Power Setting)

Showing Nose-High Attitude During Level Flight (Proper Power Setting).

Showing Nose-Low Attitude During a Descent.

FIG. 6. INDICATION OF ATTITUDE BY ALTIMETER.

Level Flight (Constant Power)

Nose-high Attitude (Constant Power)

Nose-low Attitude (Constant Power)

get from the turn indicator (Fig. 5).

Suppose you had just *overcontrolled* in recovery from a high speed dive. The nose of your airplane might be pointing to the sky, though as yet the airspeed meter has not reached a low reading. But, if you simply noted the high airspeed, you might jump to the conclusion you were in a nose *low* attitude—and continue to exert back pressure on the elevators. But if you read the *trend* (direction of movement) of the airspeed needle in this case, you would see that it is falling rapidly to a lower speed—which instantly denotes *a nose high attitude*. Realizing this, you would immediately ease forward on the elevators to correct the airplane's nose high attitude. The reverse would, of course be true in recovering from an approaching stall. Having eased the stick forward, any increasing trend of the airspeed needle—no matter how low the airspeed at any one instant—indicates a nose low attitude which immediately requires you to correct by easing off on the forward stick pressure.

The reason for the airspeed indications appearing to "lag behind" the attitude indications, is simply the momentum or inertia of the airplane. This is quite a natural phenomenon when you think about it—there is no real appreciable "lag" in the instrument. It's something you have to "take into account," and which makes pitch control a little less "mechanical" than bank control. Therefore, somewhat more practice in pitch control technique is required. But even here you have certain compensations. Pitch control is not as "critical" as bank control. If bank is well and continuously controlled, and if bank and pitch control combinations are avoided as much as possible, pitch control is not difficult.

In interpreting attitude by the trend of movement of the airspeed needle, there is one very specific and valuable bit of information we can get that is often overlooked. It is this. The instant the airspeed needle "stops," preparatory to reversing its trend—your airplane is *at that instant* in a level flight attitude. As an example, let's assume you will be overcontrolling in response to the airspeed needle increasing in a dive. Upon application of control, the needle will rapidly reverse its direction of movement, and the airspeed starts decreasing. This rapid reversal in itself indicates you have overcontrolled. But the point is that, had you noticed the *exact instant* that the needle stopped and reversed itself, you would then know you were at, or passing through, the level flight attitude and would have eased off on your back elevator pressure.

Speaking of overcontrol, there is yet another type of indication given by the airspeed needle which is of value. This indication is had by noting the speed of movement, or the rate of acceleration of movement, of the airspeed needle. Fast movement, or high rates of change of movement, are indications of overcontrol, or delayed control, and these are the two worst faults in all control of pitch attitude. Extreme deviations of pitch attitude are unnecessary and at times dangerous, and they usually result from overcontrol. Positive, immediate but "easy" use of elevators does it—correct for pitch indication *promptly*, but with control *pressures* rather than violent elevator movements. You can overcontrol yourself into trouble pretty easily!

A little practice with your airplane will show you how valuable avoidance of extreme pitch attitudes brought about by delayed control or overcontrol can be. What we want is prompt but steady and easy control pressures that will *avoid* the beginning of a "roller coaster" type of pitch oscillations. If we allow such a process to start, the tendency is to *further* overcontrol in attempting to stop the oscillations! This in turn may bring on a stalled condition, or high speed dives which result in structural stresses when recovery is attempted. The high speed dive, particularly when combined with turning flight, is the perfect, almost total pattern for abrupt and *fatal* crashes of non-instrument pilots. Don't believe *me*—just look at the official records.

• CONTROL OF PITCH ATTITUDE IN LEVEL FLIGHT

In level flight, provided only gentle turns are made, very small amounts of pitch attitude control will be necessary. This is *not* true if steep banks are allowed to develop; when that happens, pitch control becomes very difficult, and we again have the quick beginning of the "graveyard spiral."

In level flight, providing we keep the bank attitude firmly under control and if vertical gusts are absent, we may find it a little easier to note the trend or variations of the sensitive altimeter rather than the airspeed, as an indication of pitch attitude (Fig. 6). This in no sense changes our principle of maintaining pitch attitude through trends of the airspeed needle—as this is the one and *only* situation where we can utilize the sensitive altimeter for this purpose. This is just a "trick of the trade" which we mentioned and which can be used in relatively smooth air and when in level flight. Of course, the airspeed must be within acceptable limits anyway.

". . . the quick beginning of the 'graveyard spiral'."

Let's put it this way. In level flight you may use *both* airspeed and sensitive altimeter trends to correct pitch attitude. But remember that airspeed trends are *basic*, and still the primary arbiter of pitch attitude information.

If you are using the sensitive altimeter for pitch control in level flight, the same principles of attitude information apply, as with the airspeed needle. If the altimeter begins to move downward or upward, we correct with appropriate, *gentle* elevator pressures. The faster the movement of the altimeter needle, the more extreme is the pitch attitude deviation—or the more we have delayed control, or are overcontrolling. When the altimeter stops, preparatory to reversing its trend—we are at that instant in a level flight attitude. Do not, of course, attempt to use the sensitive altimeter if vertical gusts are present; in such cases, use the airspeed needle to get attitude information.

In certain rough air conditions, you may find horizontal gusts that may cause the airspeed needle to "oscillate" (within a small range) with a quick "spurting" type of movement. When this happens, simply read the "average" of the needle. Do *not try* to use pitch control in response to these quick needle movements. Only steady trends are to be acted upon. In *all* rough air, when instrument needles are fluctuating or oscillating, let the airplane "ride it out" as much as possible. Most needle movements from rough air will "cancel themselves out." "Anticipation" and a light control touch are keys to good technique in pitch attitude control. What is really meant by anticipation is, of course, being able to cover, or "cross-check" your instruments constantly and rapidly and to take corrective action by gentle pressures as soon as the needles

start to move. This is a "preventive" to the oscillations of pitch attitude which develop from delayed action and the resulting tendency to overcontrol. Level flight with gentle turns is an excellent means of practice in this "preventive technique."

• CONTROL OF PITCH ATTITUDE IN CLIMBS

In all climbs and descents, the trend of the airspeed is our *only* means of getting pitch attitude information and all climbs and descents are made at a fixed and definite airspeed. Our altimeter is moving steadily up or down, giving only *altitude* information. Pitch information comes from the trend, or movement, of the airspeed needle away from our fixed climbing or descending airspeed. While we avoid *minor* power variations, it will be advantageous to remember to reset our throttle to an *approximate* climbing power. (Remember our concept of associating altitude with power?) This resetting of power should cause the airplane to increase its pitch attitude—and you will need little, if any, back pressure on the elevator until the airspeed needle recedes to climbing airspeed. It may be, depending on circumstances, that you will have to watch the airspeed for indication of forward stick pressure. At any rate, the airspeed should be allowed to drop off *slowly* until it approaches climbing airspeed. At that point, the stick must be eased forward to allow the airspeed needle to settle at the climbing airspeed. Climbing airspeed should be at least 10 per cent greater than that used in normal contact climbs, as an added safety factor. As in descents, the altimeter is moving and indicates only altitude.

At all times in controlling pitch attitude, remember it is primarily the *trend* of the airspeed which gives us the desired information. The secret is a little *anticipation*, followed by small and steady elevator *pressures*, rather than jerky or violent stick movements. And I would like to repeat that a necessary objective of all pitch attitude control is an acceptable airspeed for the particular maneuver being executed. Both climbs and descents are always to be made at a definite, fixed airspeed. Do not overcontrol pitch changes. If trouble with pitch oscillations develops, it may be better to return to level flight before reentering your climb—provided you have sufficient altitude.

• PITCH CONTROL IN POWER DESCENTS

In straight power descents from level flight (all descents should be begun from straight and level flight), it is only necessary to maintain level flight pitch attitude with slight back pressure on the stick as power is cut or reduced to descending power setting, and the nose of the airplane drops. As the airspeed falls off to descending airspeed, appropriate relaxed pressure on the elevators is retained to *maintain* the descending airspeed. It is as simple as that. Actually the pitch attitude in power descents varies little from the normal cruising attitude. Remember to maintain the cruising attitude until the airspeed approaches the desired figure. All power descents are made at a *fixed* airspeed.

The airspeed for power descents will vary with the individual airplane but, of course, should be well above stalling speed with power off. It is suggested you experiment with your particular airplane but, in general, a speed of *20 per cent greater than a normal glide* would be satisfactory. This should give excellent control of the airplane, considering the power being used.

You should note the approximate rate of descent given by the power being used. With slight variations of power, you can readily establish an attitude and airspeed that will give you a *rate* of descent of 500 feet per minute or less. From 300 to 500 feet is an acceptable range. *After* you have established your airspeed, *reestablish* your predetermined power setting to give you the *rate* of descent you find acceptable. If pitch oscillations develop, return to level flight before reentering your descent.

• PRACTICE OF PITCH CONTROL

Pitch control is, practically speaking, the only control you have to learn which takes some "anticipation" and instrument "interpretation." It requires some technique, and must be practiced with a keen appreciation of the dangers of overcontrol, or of delayed control, or of violent elevator movement, or of letting the airspeed get too high, or low—or of neglecting firm turn control first, last and always.

At first, practice climbs, level flight and descent separately and then gentle turns, checking yourself out by visual reference. Do not attempt to combine turns with climbs or descents. Gradually you will find it is not difficult if you adhere to the proper principles and technique. After you have mastered each maneuver, practice going from one maneuver to another

Points to Remember

1. Try never to face the necessity of combining bank (and turn) control with pitch control. In other words don't use climbing and descending *turns*.
2. Power changes are used only to secure a greater or lesser rate of climb, or descent, and must only be made "approximately," and with continued positive control of aircraft attitude and airspeed.
3. In climbs and descents, a constant appropriate airspeed is the criterion of proper pitch attitude
4. Don't overcontrol. Control *pressures*, rather than abrupt elevator movements, are essential for good technique.
5. *Anticipate* airspeed and altimeter *trends* as much as possible, and correct with elevator pressures immediately, but carefully and smoothly.
6. Remember it is the trend, or direction of movement —rather than a direct, instantaneous reading—which gives you your attitude "cues."
7. A high rate, or speed, of movement—of either airspeed or altimeter—warns of delayed control, or overcontrol.
8. When the airspeed or altimeter *stops*, preparatory to reversal of trend, you *are* at a level attitude. Try not to pass *through* it and begin a series of "roller coaster" oscillations.
9. In *rough* air, the airspeed needle may "oscillate" or, if sustained vertical gusts are present, the altimeter becomes unusable as a pitch indication. Do not make pitch "corrections" for these "quick" oscillations. Otherwise, in level flight, you may utilize the altimeter as the primary pitch indication. Return to a constant airspeed for all climbs and descents.
10. Do not fail to keep your eyes moving from airspeed to altimeter, and back again (cross-checking). If the altimeter is moving from vertical gusts or in climb or descent, rely on the airspeed for pitch control entirely. In such cases, get only *altitude*, not attitude information from the altimeter. Remember, though, that altitude is important—if necessary, go into a *climb!*
11. As a general rule, and unless vertical gusts are present, it is easier to use the sensitive altimeter as a primary pitch indicator in *level flight* (including turns). In climbs and descents, of course, the airspeed must be the primary indicator.

END OF PART ONE

NEXT MONTH

PART TWO

CHAPTER V

Recoveries from Unusual Positions

CHAPTER VI

Physiological and Psychological Reactions

CHAPTER VII

Flight Planning and Weather

CHAPTER VIII

The Ten Commandments

Sabrejet buzzes radar tower at ground control station.

Maj. James Jabarra, triple-jet ace and CO of Training Squadron at Yuma AFB.

Brig. Gen. H. R. Spicer of Air Training Command strikes typical pose beside his personal *Sabrejet*.

Illustration of interceptor firing rockets at enemy bomber in collision-course angle of attack.

All-weather air-to-air rocketry, with radar pointing an unerring finger, is a revolutionary concept of combat.

OF MICE AND MEN

By ALLEN T. LEANCE

MAJ. C. T. WEAVER FELT more like a shooting gallery duck than a jet bomber skipper when an F-94C suddenly bored in on his starboard wing and fired a blast of "Mighty Mouse" rockets.

"We haven't been hit yet," Weaver remarked later, "but we see 'em go by. That's bad enough."

Weaver commanded a B-45 squadron towing targets at the Air Force's first radar directed air-to-air rocket meet staged recently above the Arizona desert in the Yuma area.

For six days, the jet bombers towed sleeves as 16 teams of the nation's hottest interceptors competed.

Two men, seated in a dark room 30,000 feet below, and plenty of miles away, were the eyes of the interceptors . . . radar teams which singled out the targets and plotted their paths with deadly accuracy for the *Sabrejets* and *Starfires*.

The hunter teams never saw their targets except as blips on their radar scopes. They didn't have to. Radar did most of the work, even to the point of locking the interceptors on their final firing courses, and triggering the barrage of 2.75-inch "Mighty Mouse" rockets before the pilot had a chance to see his victim.

"It's a concept of combat that's entirely revolutionary," said Col. R. F. Worley, commander of Yuma Air Force Base, training home for rocketry teams. "It's unlike anything we ever used in combat, and is the closest approach to push-button warfare now in operation anywhere in the world. It's as far removed from the machine gun as that device is from Alley Oop's axe."

All-weather, air-to-air rocketry is a brainchild of Lt. Gen. Ben W. Chidlaw, C.O. of Air Defense Command. Chidlaw's orders read very briefly. They were, "Defend the United States against air attack!"

Filling the order wasn't quite as simple, for the General was being told to build the world's biggest fence—12 miles high encircling some 30,000,000 square miles. Chidlaw's job was creation of a defense arm to function at the speed

of supersonic war, in any kind of weather, day or night. It meant replacement of such archaic tools as machine guns; and discarding of time-honored computations such as the old pursuit curve.

This all went out like an exhausted candle when Chidlaw's command worked up a formula of air defense that combined sonic speed, radar accuracy, and rocket hitting power. The pursuit curve gave way to a maneuver known as "leading-collision-course, intercept," a tactical gem which brings an interceptor onto its target at a 90-degree angle, and fires rockets at where the target's going to be, rather than where it is. The rockets collide with the target at a point determined by the radar computer.

This concept was dumped onto the lap of Col. Worley of the Yuma base, who was told to mold his teams in conformity with its principles. That was mid-1953. By January '54, Worley had his first training squadron under way. To Maj. James Jabarra, triple Korean jet ace and training Squadron Commander, fell the task of welding radar control teams, pilots, aerial radar-observers and maintenance men into a single mechanism whose sole function was destruction of enemy aircraft.

All these men, most of them combat veterans, were pulled from various Air Force units and put through instruction designed to make them forget how to operate as individuals and learn to work as a team. Indoctrination of flying crews was the toughest part of the job, Jabarra pointed out, because pilots and observers had to be taught that such things as visual sighting was useless.

The first thing a student of air-to-air rocketry discovers is that he's practicing a coldly analytical type of warfare, designed to eliminate as much human element as possible. In this concept, the pilot is guided by other hands. He's directed to his target by a ground control unit working highly refined radar to steer him to his target through any kind of weather. The pilot doesn't even get to fire his own rockets.

"It's not always necessary to (*Continued on page 53*)

The School of Aviation Medicine is making great strides in overcoming problems of the Jet Age.

NEW HORIZONS IN RESEARCH

By WALTER R. STEWART, *1st Lt. USAF*

THE JET-PILOT LEADER of a three-ship formation glanced over to check the position of his right wing man just in time to see him break away slowly and head for home base and for no apparent reason.

Why did this wing man feel compelled to abort his mission? What lay behind the abort? It was not the first such incident.

Flying Training Air Force Surgeon, Col. William H. Lawton, had an idea of what might be causing a pilot to discontinue a flight; he took his theory for testing to the School of Aviation Medicine, Randolph Air Force Base, San Antonio, Tex.

Col. Lawton's idea was, in a word, *hyperventilation*, the effects of breathing too rapidly over a period of time. This occurs mildly, if you blow up several balloons in rapid succession; it occurs, too, during periods of apprehension, anxiety, and fright.

When we breathe, we take in oxygen and release carbon dioxide (CO_2). Normally, this is an excellent situation; but in hyperventilation, we lose too much CO_2 too rapidly and thereby disturb the delicate role it plays in the bloodstream. It upsets the acid level and results in a condition known as *alkalosis*. The effects of alkalosis are well known. The result usually is partial spastic paralysis!

Was the young pilot partially paralyzed by alkalosis caused by hyperventilation because of apprehension in continuous close formation flying? Col. Lawton suspects this to be the case. The school of Aviation Medicine has set about finding out.

The scientists set up an aircraft trainer (called a *coordinator*), consisting simply of rudder pedals and control stick. The human guinea pig was told to watch four differently colored lights on an instrument panel and, with the appearance of a certain color, he was instructed to move the stick a certain way, or depress one of the two rudder pedals. After a few minutes of practice, the subject mastered the testing device and established a performance level of about two mistakes every five minutes.

A standard oxygen mask was then fixed to the subject and it was noted that his mistake-level rate was not affected by the mask. He was then instructed to breathe very rapidly. Samples of his breath were taken from the mask every few minutes. As was expected, the CO_2 level in each successive sample began to *decrease*—and his mistake rate began to climb!

An arbitrary performance level which indicates a ratio between CO_2 pressure in the lungs and the number of mistakes was established.

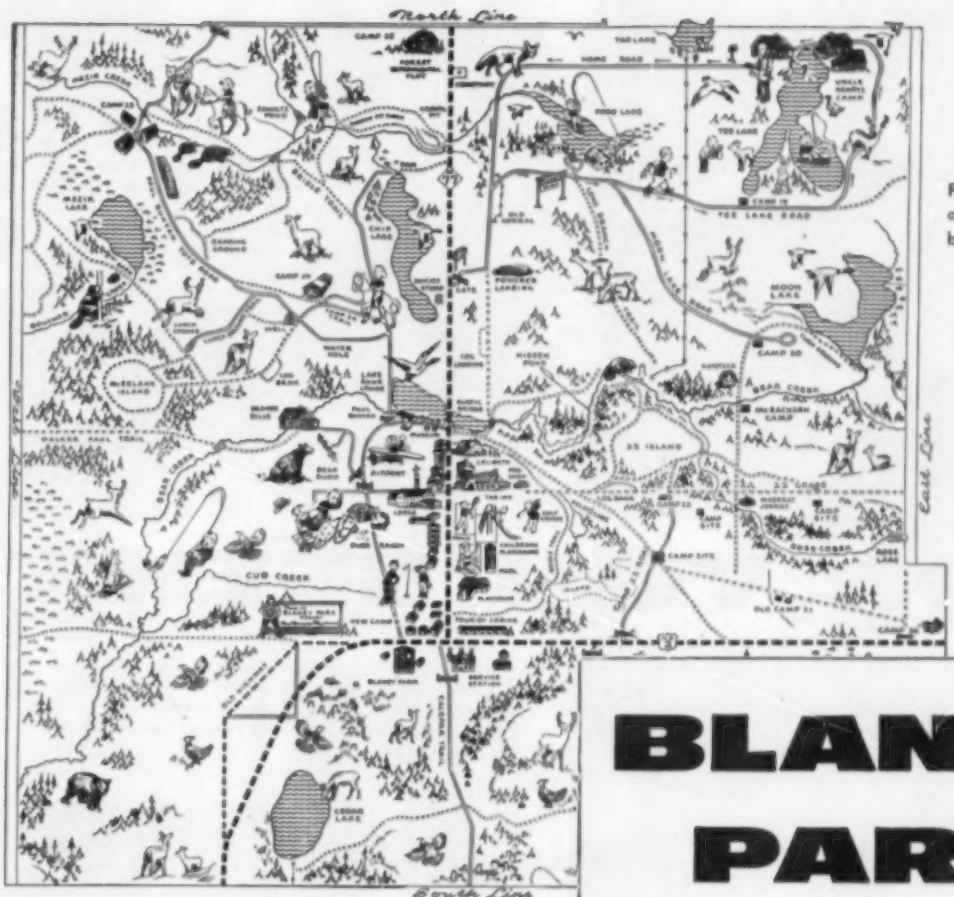
Next, an ingenious system of sampling chambers which could be installed easily in a fighter aircraft was devised. The scientists were now ready to collect breath samples from pilots under actual flying conditions.

Several of these sampling chambers are currently being used at Webb Air Force Base, Big Spring, Tex., in an effort to find out whether student pilots reach a critical CO_2 level in difficult flying situations. If this occurs,

(*Continued on page* 50)

Right: Research Assistants A1/c Harvey Hawkins (left) and S/Sgt. Joseph C. Rawdon (right) take breath sample and breathing rate of Air Cadet Paul G. Tomlinson, Jr., at Webb AFB, Tex

Above: S/Sgt. Rawdon uses device to determine carbon dioxide content of breath samples taken in hyperventilation test shown at left



Pictorial map showing some of the many activities to be enjoyed at Blaney Park.

BLANEY PARK

A bit of the natural beauty of primitive Upper Peninsula of Michigan.

By WALTER X. BRENNAN

DEEP IN THE FORESTS of Michigan's Upper Peninsula is located Blaney Park, the country's oldest fly-in resort, one of the finest according to many, and presently a bright spot in the private flying picture in America. Manager William L. Earle tells us that, for the past three years, private flying at the airport has been booming. He says it's just like everyone dreamed about in 1946. He'll also admit that, during the many years since the airport was opened in 1928, it might better have been turned over to grazing his riding horses.

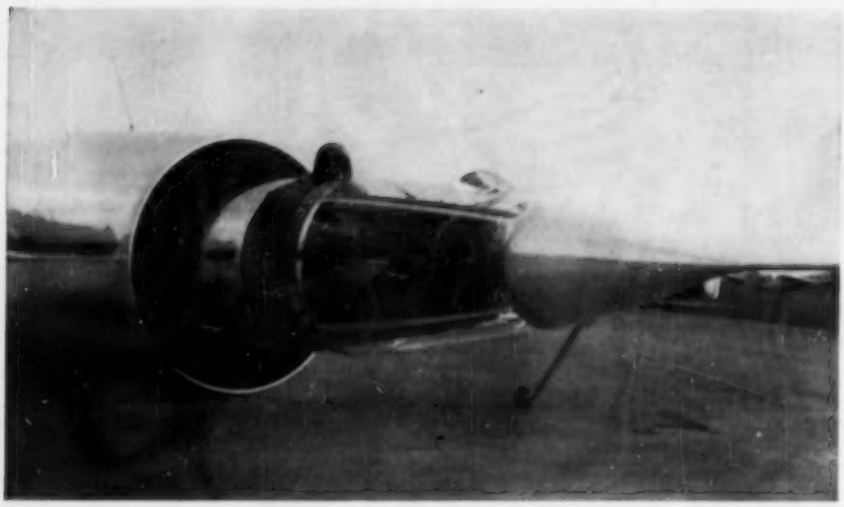
Blaney Park, in keeping with the Paul Bunyan tradition, is big in many ways—54 square miles of giant pines and lakes, 75 miles of borderline fence, 50 miles of private roads and almost that many miles of trails and firelanes.

While the airport is small in footage—2,250 feet for the longest run, it gives big field performance. The beautifully sodded and well-kept turf is located on the highest knoll giving perfect natural drainage and allowing low approaches. For take-offs into the west or south, (prevailing winds) you fly right off the end of the field to see either the pleasant valley or the huge golf course fall away below. A "140" with two adults, a ten-year-old boy and their luggage gets out without the slightest difficulty.

Through the years, Blaney was host to the air tours of the early thirties, the dawn patrols and Flying Farmer flights of more recent years, and to thousands of individuals. Before it became a resort, Blaney was one of the big lumbering operations from the 1880's to the 1920's.

Owned by Stewart E. Earle, the old lumber camp was turned into a resort when logging ceased. Owner Earle sits at the same desk in the community's general store where he served as a bookkeeper in days long passed. The quaint camp buildings have been modernized, to become plush accommodations for users of today. Experts in aviation, golf, and other recreations were called in. Only the general store and post office would be recognized by the lumber jack of yesterday. The owner's sons William L., John C., and George E. assist their father in the management.

Blaney offers simple or elaborate accommodations for a total of 300 guests in a motel at the junction of US-2 and M-77, where cottages also line the edge of the airport, and cabins look out on lakes deep in the woods. If you like to rough it, there are camp (*Continued on page 60*)

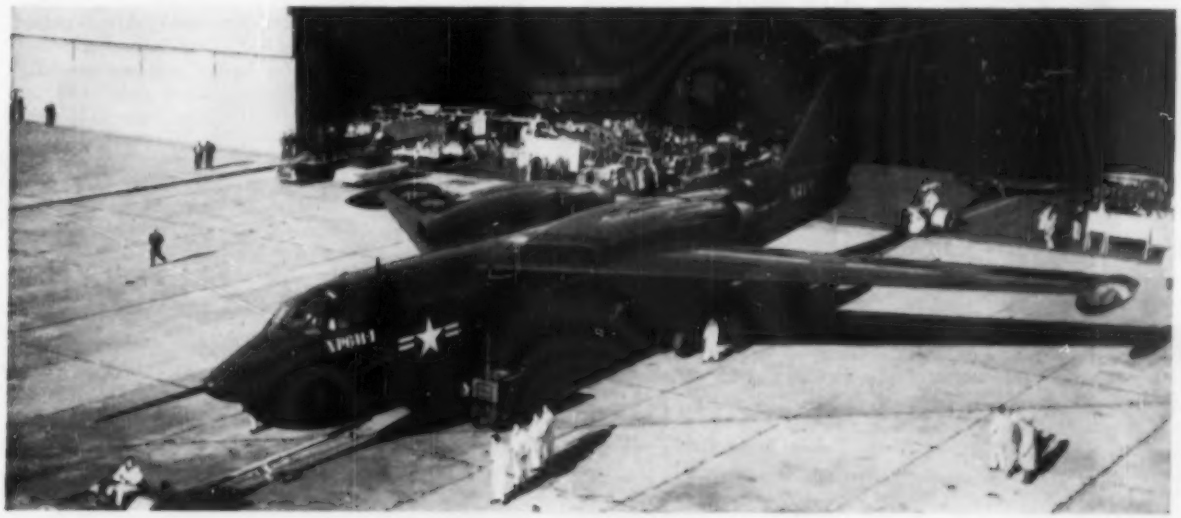


RAM-JET Left: Unusual plexiglass cockpit of the French Leduc 021S,—supersonic research aircraft, is located ahead of the intake duct of the ram-jet engine and can be jettisoned as a capsule. Shown here is test pilot Littolff. Landing gear is of the tandem type with wing-tip stabilizing skids.

HAVE YOU SEEN?

PILOTED BLAST-OFF Below: Launched like a guided missile, a piloted Air Force F-84 jet fighter demonstrates takeoff technique that may eliminate need for front line airstrips. Zero-length launcher is same used for the Martin *Matador* guided missile. Plane is raised to launching angle and, with turbo-jet engines running at full speed, is blasted off by booster bottles so fast it is immediately airborne. Martin test pilot Bob Turner says shock of takeoff is less than normally experienced during catapult takeoffs. Plane is always under the pilot's control and reaches a peak acceleration of four G's

F-102A Above: Modified version of the Convair delta-wing F-102, Air Force supersonic all weather interceptor, exceeded speed of sound in level flight on second flight. Note longer fuselage, cambered leading edges and swept-up wing tips. Inset shows closeup of elongated after end of the fuselage with streamlined fairings in the afterburner area.



MULTI-JET SEAPLANE Above and right: World's first multi-jet attack seaplane, the XP6M-1 Martin *SeaMaster* is powered by four Allison J-71 turbo-jets with takeoff afterburners. The big swept-wing plane is designed to cruise at 40,000 feet, is capable of speeds over 600 mph. Its two primary missions are minelaying and photo-reconnaissance. Wing tips have permanent plastic floats to supply wing-tip buoyancy when the aircraft is at rest in the water. The hull contains a water-tight rotary mine door on which mine stores or camera pod can be installed. Crew of five includes pilot, co-pilot, navigator-minelayer, radio operator, gunner.

No. 182

I learned about flying from that !

By DOUG BAKER

All sorts of misfortune befell this charter pilot on Friday the 13th.

THE WEATHER THIS MORNING, in the Ozark Mountains of northwest Arkansas, was about what you could expect during the first half of March. The wind was out of the south at 15 mph with gusts. We had a solid overcast hugging the heavily wooded hills on each side of the narrow valley that cradled my small airport. The local "Fly-Boys" always referred to it as the State Line Airport; the north end of one runway touched the Missouri state line.

I had a charter trip this morning to Tulsa, Okla., where my passenger, an attractive young lady, was to catch an airliner for Amarillo, Tex., at 9:30. It was about 8:10 when I rolled out the Bellanca *Cruisair*, and turned on the range receiver to bring in Joplin Radio. The latest weather sequence for that area was being broadcast. As luck would have it, I missed the Tulsa weather, but did get the Wichita report. Wichita lay 200 miles northwest of us and was reported clear. Joplin gave its weather as broken clouds at 1,500 and improving. As Tulsa was a hundred miles almost due west from my field, I felt sure the weather would improve the closer we approached our destination.

My passenger arrived and was ready to go. After a visual inspection of the ship, I put her suitcases in the baggage compartment and we were taxiing out when she questioningly looked toward the west side of the valley to ask how the weather was supposed to be. I told her Wichita was clear and I was sure Tulsa weather would be better than what we were having; also that we should be in Tulsa within 40 minutes after take-off. I assured her we had plenty of time to catch the airliner, as it would be at least an hour and ten minutes before it would leave Tulsa.

We made a quick take-off on the south runway and I headed down the valley in a normal climb until I could look west over the tops of the hills that lay between us and Tulsa. There was about 500 feet between the clouds and the tops of ridges. Setting course for "The Oil Capital of the World", I tried to radio Fayetteville, Ark., 30 miles south of us, to file a flight plan and get an accurate check on Tulsa weather. I had no luck at all in reaching either the Fayetteville or Joplin stations, since we couldn't get high enough, without going into the overcast, for my transmitter to reach them.

As the overcast was not yet pushing us too close to the wooded hills, I decided to continue on course. After another ten minutes, the clouds began to force us closer and closer to the tops of the trees. Thinking surely we should encounter better weather soon, I was not worried. It was time for another weather sequence. I tuned in Tulsa and learned with chagrin that the fields in that area were completely "socked in." I wasted no time in making a "180", at the same time explaining to my passenger that we would be unable to get into Tulsa.

Another five minutes on our reverse course and the clouds pushed us right down on the tree tops. I could see that the ceiling would be zero in a very short time.

I now found myself wishing I had made a more thorough check of the weather, and set my directional gyro preparatory to going on the needle and ball. Our only alternative was to get on top and head for better weather towards Wichita. I trimmed the ship for a shallow climb and set my heading as nearly in the direction of Wichita as I could calculate. There was no time right then to start thumbing the map case to study Wichita facilities.

My passenger definitely was not overjoyed with the whole affair, although I was able to maintain a fairly steady heading, considering the turbulence we were encountering. After climbing to 2,000 feet, we broke out on top—which didn't make me the least bit unhappy. I was now able to contact Tulsa on VHF and check weather again for Wichita, while filing a flight plan. Soon Wichita's low frequency range signal came faintly. In a few moments I was able to get the exact heading by using the loop antenna. Twenty miles southeast of Wichita, the overcast broke up and it was CAVU the rest of the way in.

The tower instructed me to use runway one eight, right, as the B-47's were making touch-and-go landings on the longer runway, one eight, left. We had to taxi around a long row of jets to reach the parking area.

My passenger was now safely back on mother earth, but at a considerable distance from her original destination. However, after checking with TWA, I found she could soon get a flight direct to Amarillo. This was the first pleasant news I had for the patient young lady since we had left Arkansas. After paying the added expense of her ticket from Wichita, I thanked her for being so calm. I walked over to the flight line office, paid my gas bill, and checked the weather, to find conditions now rapidly improving down towards the Mason-Dixon Line.

I watched a couple of B-47's make full-stop landings with the help of their drag chutes and crawled back into the Bellanca for my return trip. Getting clearance to taxi for take-off, I swung back around the row of jets to the main taxi strip. From there the tower advised me to head north for take-off on the same runway on which I had landed. About half-way down (*Continued on page* 63)

First production model of

U. S. Navy's new fighter

surpasses speed of sound—

during routine delivery flight

—the Douglas F4D Skyray

The pilot was seeking no record. But suddenly, his *production model* Douglas F4D Skyray was flying faster than the speed of sound *in level flight!*

Though this supersonic show of speed was unscheduled, it came as no surprise. Skyray is holder of the world's official F.A.I. sea-level speed record at 753.4 m.p.h. Designed for interceptor duty with the U. S. Navy, it is powered by a Pratt & Whitney J-57 engine with afterburner. Agile as well as fast, Skyray has a very high rate of climb and low landing speeds—operates with ease from aircraft carriers...to strengthen the fleet air arm.

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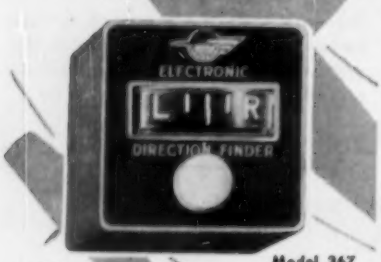

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★ COMPACTNESS—MEASURES 2¼" x 2¼" x 8" . . . CIGARETTE-PACK-SIZED FLUSH-MOUNTED LOOP.
★ MEETS AIR ASSOCIATES' HIGH STANDARDS OF DESIGN, PERFORMANCE AND FAIR PRICING.

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	TO APPROACH CONTROL	122.5 mc.		3023.5 kc.
	TO RANGE	122.1 mc.		3023.5 kc.

L I S T E N S	TO TOWER (PORTLAND)	118.7 mc.	278 kc.
	TO TOWER (OTHER)	?	?
	TO RANGE (PORTLAND)	122.2 mc. & 117.4 mc. (VOR)	332 kc.
	TO RANGE (OTHER)	?	?
	TO APPROACH CONTROL (PORTLAND) (OTHER)	118.7 mc. All tower frequencies	332 kc. LF range frequency
	TO MARKERS	75 mc. (Special receiver required)	

*NOTE:—Due to congestion on 122.5 mc., it was necessary recently to replace it with 122.7 mc at the following airports: New York (La Guardia), Los Angeles (International), and Chicago (Midway). At present these are the only towers not standardized on 122.5 mc.

UNICOM	(Private aircraft to private aircraft)	TALK & LISTEN	122.8
EMERGENCY		TALK & LISTEN	121.5
GROUND CONTROL	TALK & LISTEN to tower on 121.9 (if you have it) for taxi instructions. It eliminates congestion on other tower frequencies.		

Tower Talk

(Continued from page 19)

we know to get abreast and stay up to date with those frequencies is to sit down and memorize the following ones. Then try to read an occasional Airman's Guide for those special cases where they change basic frequencies due to increased traffic densities.

In the above listings we've used frequencies on which radio facilities in the Portland, Ore., area operate. We suggest you get your local aeronautical chart and radio facility chart and insert the proper frequencies for your own area. *All frequencies* published on aeronautical charts are *listening* frequencies for the aircraft. VHF are listed in blue figures, LF in red. Ask your local radio man or flight operator to check you and you'll find that, once you understand these basic frequencies, you'll not listen on the wrong line. Remember, *before* approaching a strange airport, familiarize yourself with tower and range transmitting frequencies. That will give air traffic controllers their first clue that you know your business, and you will be expedited accordingly.

One last suggestion to help you get more satisfaction and utilization from your radio equipment is that you investigate the following government publications, which may be secured from the Supt. of Documents, Government Printing Office, Washington 25, D. C.

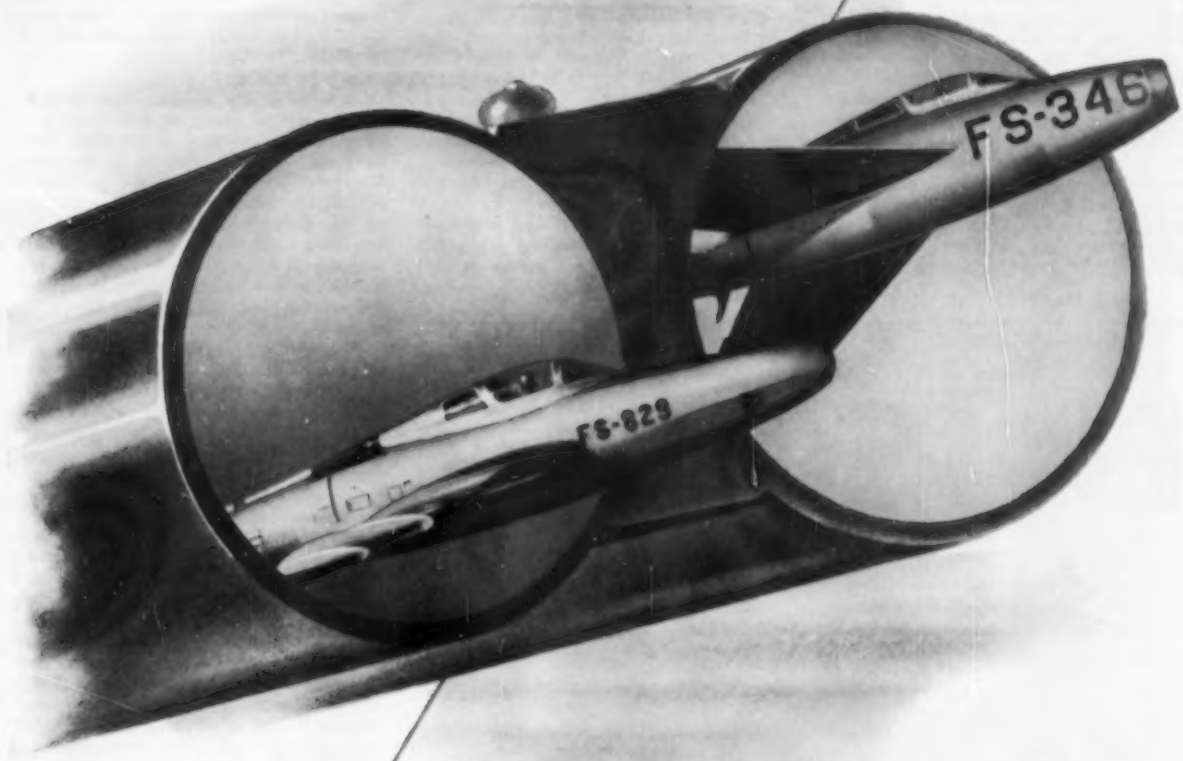
Pilot's Radio Handbook #102.....$ .55
Flight Information Manual, Vol. 8.. .50
Radio Facility Charts (each)..... .25
Airman's Guide (subscrip. per year) 2.75

You'll find they have considerable vital and interesting information in them. END

CAN YOU NAME THIS PLANE?

(Answer on page 66)

DOUBLE BARRELLED!



Deadly efficient are these two defenders of Democracy . . . and the USAF is ready to "let go" with both barrels should the need arise. ➤ ➤ ➤ *One of these twins, the* **F84F THUNDERSTREAK,** *is now in active service and able on instant notice to deliver its nuclear wallop in retaliation.* ➤ ➤ ➤ *Its photo-reconnaissance counterpart, the* **RF-84F THUNDERFLASH,** *has power and speed to locate the target, identify it in detail by use of the latest aerial photographic equipment . . . and if necessary, fight its way home guarding the secrets it has uncovered.*

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REPUBLIC AVIATION

FARMINGDALE, LONG ISLAND, N. Y.

Designers and Builders of the Incomparable **THUNDER-CRAFT**

New Horizons in Research

(Continued from page 42)

it may be concluded that hyperventilation does take place in situations which induce apprehension in the pilot.

A second interesting project now under way at Randolph is a restudy of morphine, the most famous of all pain-killers. Dr. Robert Bauer is concerned about morphine's undesirable effects. While it will indeed alleviate suffering, the use of morphine presents problems of respiratory depression, nausea, and loss of muscular coordination.

Two countries produce morphine: China and Turkey. Our entire supply, of course, comes from Turkey. If that source should be cut off for any reason, we would be faced with a disastrous situation. The prospect of casualties resulting from nuclear attack on the U. S. serves to intensify our strategic disadvantage.

A new drug has been developed and given the name *Nalline*. It is a morphine antagonist; that is, it has an opposite effect on the body. In morphine addicts, a dose of nalline taken immediately after a dose of morphine produces instantaneous withdrawal symptoms—sweating, nausea, and an obsessive craving for more morphine.

Dr. Bauer is exploring what will happen if morphine and nalline are given simultaneously. Will the morphine still relieve pain while nalline counteracts its undesirable effects? Can a synthetic drug be made that will replace a successful morphine-nalline combination? *Methadon*, a coal-tar derivative, may hold the answer to this problem. It costs only about half as much as morphine and, of course, its local manufacture solves the supply problem.

Dramamine, the wonder drug used to prevent motion sickness, was developed by two scientists who, at the time, were working with the School of Aviation Medicine. Where these two gentlemen left off, Dr. Herman I. Chinn has carried on. Dr. Chinn's experiments include the screening of new drugs in airborne and seagoing passengers. Each year, between November and March, thousands of passengers crossing the North Atlantic by Military Sea Transport are tested.

With the appearance of heart disease as a major disabling factor in Americans over 40 years of age, the Air Force is extremely anxious to pursue research also in this direction. Under the supervision of Lt. Col. Lawrence J. Milch (a pilot-scientist), an entire class of military cadets is under study. Careful case histories have been compiled and reviewed. They will be screened again as each officer reaches the age of 38. Predictions made now will be correlated then with the facts. If the Air Force can establish a reliable criterion for selecting future officers who show no predisposition for circulatory disability, many millions of dollars will thereby be saved. Col. Milch is also busy seeking to determine if there are any forces at work in Air Force life that increase probable occurrence of heart disease.

In the area of aircraft accidents, in cases where it is suspected the pilot suffered from *hypoxia* (lack of sufficient oxygen), the school is working on the detection of chemicals which appear in hypoxic tissue. If a reliable indication can be found, it will then be possible to examine a tissue sample from an "hypoxic" pilot, and determine whether hypoxia was really the cause of the accident. Such a process, indirectly, will save many lives by stimulating investigators to search for the actual cause of a seemingly unexplained accident for which the all-too-convenient decision in favor of hypoxia is the most expedient course. Scientists do not agree that the proportion of accidents attributed to hypoxia can possibly be explained that simply!

These are but a few of the many projects currently under study at the School of Aviation Medicine. They are, perhaps, not overspectacular themselves. Experimentation does not necessarily imply success. Yet success rarely comes in these fields except through application of imagination and the scientific methods of dedicated people.

Since the air age is upon us and we must prepare ourselves for mediums, there are infinite physiological problems to be studied and solved. No more gratifying realization is possible for these scientists than to know that as a result of their work the whole world benefits eventually and Man is better equipped to overcome himself. END

BUSY

MOODBEAMS # 4

The only thing busier than a modern housewife without an automatic dishwasher is a modern aeronaut without an automatic pilot.

Dishes can be cleaned nowadays at the flip-of-a-switch, enabling Dee Brock (24, 126 lbs., 5'7", blonde, green-eyed) to settle down with a good book—or something.

An airplane can be flown pretty much the same way — with an ECLIPSE-PIONEER PB-10 AUTO-PILOT, enabling you to settle down in the luxurious role of monitor-only, making precision turns, controlling your altitude, neatly trimming the aircraft and, finally, through its FLIGHT PATH COMPUTER, locking into ILS to bring you safely and surely home down the Glide Path.

Write for an eye-opening CASE HISTORY of a SAC-installed PB-10 at work in one of the nation's busiest business airplanes; descriptive literature and cost estimates.

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HAVE YOU FLOWN THE Tri-Pacer 150?

Fast, far-ranging, yet simpler to fly than any plane available today.

That's the new 150 horsepower 1955 Tri-Pacer 150 with over 130 mile-an-hour cruise, increased pay load, more climb and new, striking beauty.

Yes, the Tri-Pacer has all the performance needed for useful, time-saving, money-making business travel. It also combines the most features to simplify flying for the man just starting to use a plane for business—tricycle landing gear, simplified controls and built-in flight safety so characteristic of all Piper planes.

Whether you're just starting or an old hand, you'll find the Tri-Pacer 150 the ideal combination of solid, useful performance and flying ease...and priced far less than any other production 4-place plane. See the beautiful new 150 at your Piper dealer's today or write for new full-color brochure, Dept. G-4, Piper Aircraft Corp., Lock Haven, Penna.

THE TRI-PACER COMBINES THE MOST FEATURES TO SIMPLIFY FLYING

TRICYCLE LANDING GEAR takes much of the skill out of take-offs and landings, makes "stalling-out" unnecessary, eases handling in high winds. Exclusive on the Tri-Pacer in its class.

SIMPLIFIED CONTROLS inter-connect rudder and ailerons for easier learning, more restful travel. Another Tri-Pacer exclusive in its class.

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AIRCRAFT OWNERS AND PILOTS ASSOCIATION

AOPA NEWS

Aircraft Owners and Pilots Association is a service organization for the private pilot or aircraft owner. AOPA's full time staff is devoted to helping the individual pilot. Its aim is "To make flying more useful, less expensive, safer and more fun."

Headquarters address is Box 5960, Washington 14, D.C. Members also receive a special AOPA edition of FLYING, newsletters and confidential aviation data. Opinions expressed in this column are not necessarily those of FLYING Magazine.

JET INDOCTRINATION

AOPA's assistant general manager and editorial director, Max Karant, (AOPA A18) attended the U. S. Air Force's Senior Officers jet instrument indoctrination course at Moody Air Force Base, Valdosta, Ga. during the week of December 12-17, 1954. Karant was one of several civilian aviation representatives invited to the course in recent months by the Air Force to promote better understanding between military and civilian groups of their respective jet-created problems.

The course consisted of five days of highly concentrated, intensive training, both in the air and on the ground. Each student in the class got 10 flying hours in Lockheed T-33 jet trainers, about 05:30 in Link trainers, and about 13 hours of ground school.

Reporting in the March, 1955, issue of AOPA's magazine, The PILOT, Karant described his experience and discussed the jet pilots' requirements and their relation to the work of air traffic controllers and other pilots.

"Of greatest interest to AOPA, of course," Karant said, "was the nature of the jet airplane as a class. We came away with some rather firm basic conclusions:

"The jet airplane, any jet airplane—is by its very nature intolerant of mistakes. It is extremely gentle—noiseless and vibrationless. Its knottiest problem is fuel consumption—the T-33 burns 527 gph at sea level, 200 gph at 35,000 feet. Flights in jets must be planned to the last detail—there's no forgiveness for wandering around to find yourself after you've done a poor job of navigating.

"While jets present unique problems for traffic control—because of their fuel consumption and precise timing requirements—there is every indication that the problems can be worked out satisfactorily.

"The jet indoctrination course at Moody demonstrated clearly that the pure jet airplane has a number of special problems when it comes to using the air space along with other aircraft. But it is also clear that special procedures can be developed—and have been—to enable this type of aircraft to operate safely. They should be given expeditious handling, especially in instrument approaches. And they must be required to slow down so that they can see other aircraft when flying VFR. But one safety consideration stands out above all: high-speed jet airplanes will not tolerate careless or reckless flying. Everything happens so fast the careless pilot can wind up in a mid-air collision in a split second. So the jet pilot must always be thorough, cautious, and unusually well trained," Karant said.

The jet time Karant acquired adds to the accumulated flying experience of AOPA's National Headquarters staff which numbers six pilots—two commercial (one is an instructor), three private, and one student—and offers a total of 18,972 hours combined flying experience.

AOPA FLIGHT SERVICE

1954 was a busy year for AOPA family flyers who traveled the world over for business and pleasure. It was a busier year for AOPA's Flight Service Department staff, Mrs. Joan Jones (AOPA A86425) and Miss Lillian Wall, who planned 842 foreign flights and 475 domestic flights for AOPA members.

While it is impossible to learn exactly how many of the 1,317 flights planned by the department were actually made, it is believed that almost all of the domestic ones and more than half of the foreign ones were completed.

The longest foreign flight planned was that of an Aero *Commander* to the Kingdom of Yemen in Southwest Arabia. The shortest domestic jaunt was less than 200 miles, planned for a low-hour pilot. The largest plane used for an AOPA-planned flight was a DC-3 which flew the North Atlantic. The smallest one, which carried its two occupants to Sao Paulo, Brazil, and back to West Virginia—some 16,000 or more miles—was a Taylorcraft.

During the year, more than 25 AOPA-'ers made flights around South America—south through Central America to Chile, across the Andes to Argentina, up through Brazil, along the northeast South American coast, and island-wise through the Caribbean to the U. S. Hundreds more visited nearby spots like Canada, Mexico, and Cuba.

Each year the number of AOPA'ers who use their planes for foreign and domestic vacationing increases. The 1954 flight assistance requests received by AOPA totaled 300 more than were received in 1953. The increased volume indicates that the importance of AOPA's flight assistance service is gaining recognition at the same pace that lightplane travel is increasing.

Flight planning and flight assistance by the Flight Service Department for trips to any place in the world, are two of the many valuable services available to AOPA members.

"Malnutrition case. Another glider pilot who ran into an interesting series of thermals without rations along."

Of Mice and Men

(Continued from page 41)

fire at a 90-degree angle, however," said Maj. Vermont Garrison, another jet double ace of Worley's staff. "The attack can be made from any quarter, but the beam attack gives us more area at which to fire, and gives the pilot a chance to get away with a minimum of exposure."

The Mighty Mice are touched off in batches of 24, spattering the target zone in a pattern resembling that of buckshot. The idea is that at least one hit will be scored out of the entire load.

"And one hit's all we need," said Jabarra. "One of these rockets packs a big enough punch to knock down any bomber flying today."

Jabarra is hepped on the subject of rocketry, but points out that this strategy has not removed all human element from air defense warfare. "The pilot is still the guy who gets shot at," said the stubby, cigar-chewing ace. "I think that's a pretty big human element."

The trouble is that man's really a doddering fossil, unable to operate with the speed and sureness of his weapons and so is superseded by devices able to compute and fire accurately at supersonic tempos.

Let's go on a flight with Capt. D. A. Englehardt, and his radar observer, Capt. W. J. Zwartjes, victors of the historic rocket meet.

We find ourselves routed for action by two men bending over a switch-studded panel, oblivious to the bustle around them, as they watch a dimly-lit screen. One of these men, Capt. George Freed, is tracking the course of a silver speck moving on the face of the screen. The other, Lt. Gordon Schott, is speaking clipped words into a telephone. His voice is crackling in Englehardt's earphone as the *Starfire* pilot cruises above the overcast some 30 miles away. Freed and Scott are setting up a target for the rockets nestled in the wing pods of Englehardt's *Starfire*. The target, in this case, is the 9-by-45-foot nylon sleeve flapping behind Major Weaver's B-45.

"Bogie at 27,500 feet, 30 miles, 28 degrees port," snaps Freed, as he picks up the target blip. Schott relays the information to Englehardt. The *Starfire* suddenly flicks on the screen as a smaller blip, moving in at right angles to the course of the bomber, as Schott relays further bearings.

"I've got him," Zwartjes shouts exultantly from the *Starfire*, his voice sounding from a control-room loudspeaker. Tension in the blacked out room takes on a wartime pitch.

"We're on," the pilot's voice reports a split-second later, signifying that the *Starfire* is locked onto its target and that the jet is being guided by radar as it homes in at around 600 mph.

Shortly the blips merge, then pull part. Englehardt reports: "Rockets off!"

The ground observers watch the screen intently. "Target away," shouts a chase plane pilot, stationed on the interceptor's tail, to make sure he locks onto the sleeve instead of the tow plane. This meant that Englehardt's rockets had blasted the sleeve from its tow cable—a clean hit. So our team marks off a perfect mission for the afternoon.

But the team that followed almost stopped the show with an unrehearsed bit of byplay. This time it was a *Sabrejet* pilot who smartly locked onto his target but was told to break off by his chase man. "You locked onto the tow ship," the chase man explained, "and you were making the boys feel a little bit uncomfortable." The tow skipper came up with some violent and interesting evasive maneuvers not incorporated in B-45 operation manuals. A preceding jet had shot away the target sleeve's reflectors (metal discs affixed to the nylon to reflect the radar beams). Ordinarily, the interceptor pilot can distinguish his target by the size of the blips, but when the reflectors are gone, the only blip left is the tow plane.

"There's usually plenty of time for the chase man to call off the interceptor," said Lt. Raymond E. Stratton, a tow plane pilot.

"Yeah," agrees Capt. Lloyd McGrady, another towman, "But when we know that radar has its claws in us instead of the target, we get real interested, fast!"

END

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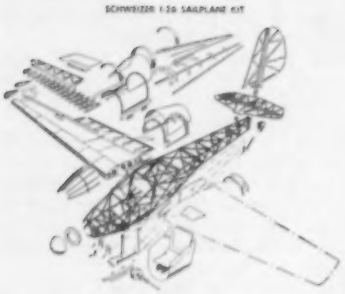
KIT SAILPLANE

A PRACTICAL aircraft project within the price range of the average enthusiast or group, the Schweizer 1-26 high-performance sailplane has been granted an Approved Type Certificate by the CAA. Designed principally for kit construction, the 1-26 is the result of intensive testing, experimenting, and an exhaustive polling of gliding enthusiasts throughout the country.

According to the manufacturer, the 1-26 can be completed in from 300 to 600 man-hours, depending on the experience and skill of the builder. This means that an individual can complete the sailplane in his spare time over a four to eight month period.

The all-metal structure of the 1-26 simplifies and expedites the home-builder's work in assembling the ship. With the exception of fabric covering on the fuselage and parts of the wings and tail, the plane is entirely metal. All the complicated alignments, welding and assemblies requiring specialized tools and equipment are already completed by the manufacturer before the kit is delivered. Each kit is accompanied by a comprehensive manual and complete, easy-to-read blueprints.

Nearly 40 of the sailplane kits already have been ordered by soaring pilots and glider clubs, and Schweizer is rapidly gearing up its 1-26 production.



SCHWEIZER 1-26 SAILPLANE KIT

Price of the kit varies from $1,375 to $1,495, depending on whether dope, fabric and such items are to be supplied. The plane will also be available in completed but uncovered form and in fully complete form. No definite price has been set on these but the fully completed 1-26 is expected to sell in the neighborhood of $2,500.

Further information can be obtained by writing: Schweizer Aircraft Corp., County Airport, Elmira, N. Y

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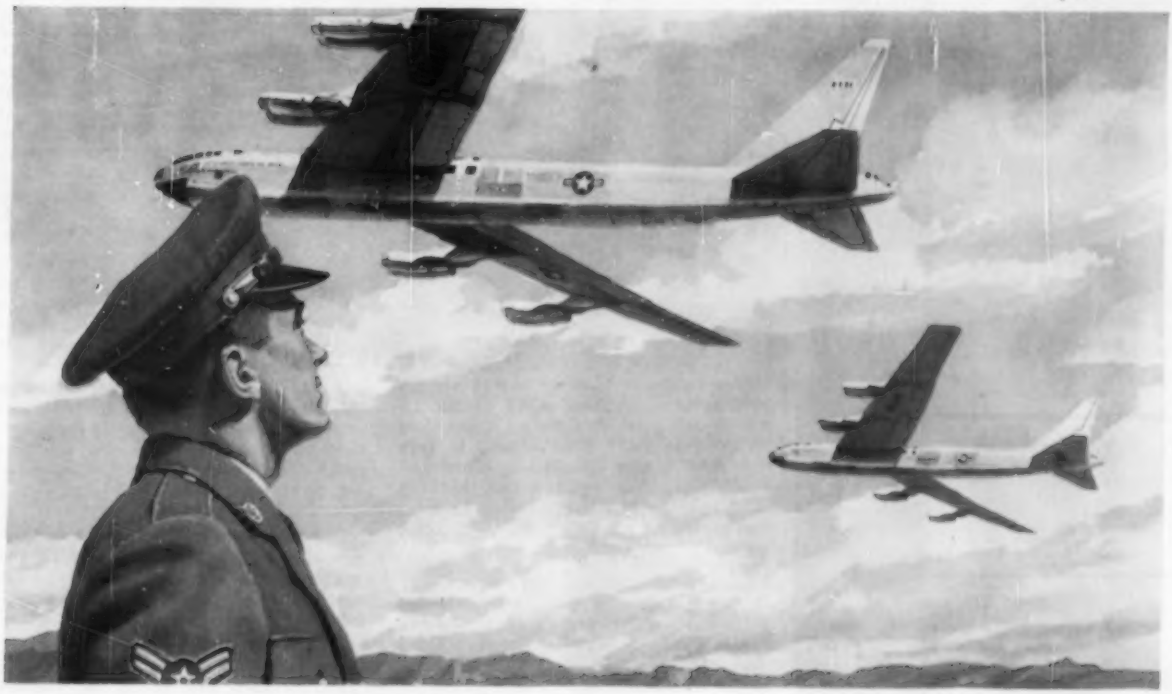

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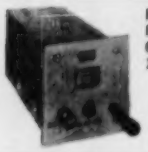
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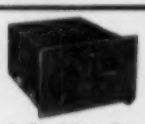
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Briefings . . .

(Continued from page 10)

held March 12-17. In addition to dinners and parties in Miami and Havana, there will be flights to Cienfuegos, Mayajigua and Veradero, with native dinners, fishing trips and other excursions.

A COLLECTOR'S ITEM, the new book "Aircraft of the 1914-1918 War" contains data, photographs and full-page 1/72 scale 3-view drawings of 80 aircraft — British, German, French, Italian and American; text and pictures of 24 models; and pictures alone of 94 rare types. Price $11.95 from A. Hofmeister, 10 E. Overlea Ave., Baltimore 6, Md.

TOTAL NUMBER OF AIRCRAFT registered in the entire rest of the world are far outnumbered by the 64,875 owned by individuals and businesses (excluding airlines) in the United States. In fact, the 10,847 planes operated by citizens of California alone come within 1,094 of equalling the 11,581 civil planes that are the combined total operated in 21 other nations.

MAKE YOUR OWN study and reference book on flying weather by subscribing to the U. S. Weather Bureau's Daily Weather Map. A series of practical information articles is printed on the back in such a way that they may be clipped, folded, and placed in a looseleaf binder. Subscriptions are 60 cents a month, or $7.20 a year, from the Superintendent of Documents, Government Printing Office, Washington, D. C.

WHEN THE USS *Forrestal* enters service early in 1956, the giant aircraft carrier will have a complement of 3,500 personnel and will be able to handle 125 aircraft. Her four steam catapults can be used simultaneously and her arresting gear can bring a 70,000 lb. aircraft to rest in 150 ft. after touching down at over 100 mph.

ABSENT-MINDEDNESS caused many of the 3,000 small-plane accidents investigated during 1954 by the CAA. Only a small proportion caused serious injury but many were strictly unnecessary. For instance—an amphibian that turned over when it was landed on water with its wheels down; or the pilot who got so interested in looking at a giant spiderweb about 60 feet long attached to another plane that he taxied right into the other ship; and then there was the pilot who took off down wind—didn't mean to, just absent-minded—and mushed into telephone lines at the end of the field.

AN HISTORIC STONE from the Gothic Cathedral of Rouen, France, has been presented to the Catholic Guild of Idlewild Airport in New York by Air France. The symbolic stone will form part of the International Shrine of the new Catholic chapel "Our Lady of the Skies", located in the International Gardens at the airport.

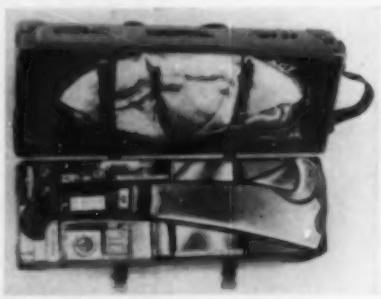
TO INCREASE ITS aircraft spotters and air defense filter centers, the Air Defense Command's Ground Observer Corps has set a goal of over a million volunteers in 1956 as compared to 375,000 enrolled at present. GOC posts will be increased from 15,000 to 24,000, and filter centers from 49 to 73. By mid-1955, GOC will be operating in all 48 states. At present the Corps is active in 36 states, but on a 24-hour active basis in only 27 of the states.

IF THE INCH IS IN THE RIGHT PLACE, one inch can mean 60 to 100 miles on a modern U. S. transport. A new turbo supercharger used on a high-speed airliner reduces engine temperatures so that less cooling air is needed, and makes it possible for cowling flaps to be closed about one inch more to reduce drag. This reduced drag increases the aircraft's range approximately 60 to 100 miles under normal operating conditions.

A MOTEL IS BEING BUILT near the airport at Sandusky, Ohio. The field has turf runways, snack bar, available hangar space and no landing fees. The area is reported to be excellent for hunting and fishing on Lake Erie.

A TWO-PLACE JET racing or training plane, designated the SK-1, is being built by the British firm, Somers-Kendall Aircraft Ltd. Powered by a 330 lb. static thrust Turbomeca *Palas* turbojet, the plane will be flown by the well-known racing pilot, Nat Somers.

DESIGNED WITH THE HELP OF THE RCAF, this unusual survival kit for the "civilian pilot in distress" contains more than 40 items—everything from signaling devices and plastic rainpouch to stove and rations. Basic tool of the kit is the Global Survival Axe, a modification of the famous Woodman's Pal. Weight is 11 lbs.;



(Continued on page 67)

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Outstanding among the many new features of the 1955 Cessna 180 is a new "hushed" cabin . . . engineered to give you almost unbelievable quietness in flight.

Over-150-mph speed—outstanding luxury, stability, ease of handling—you get all that in the Cessna 180 . . . and now a great new advantage has been added! Cabin quietness so complete you have to experience it to believe it—made possible by an improved engine that delivers the same horsepower at fewer RPM's—relocated ventilator intakes—and a new ¼-inch thick windshield. Yet you get all this at the same low price of $12,950 f.o.b. Wichita. Ask your Cessna dealer to demonstrate or write CESSNA AIRCRAFT CO., Dept. F-3, Wichita, Kansas.

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Long, wide "Para-Lift" flaps give your Cessna 180 easy access to the smallest landing areas, lowers the airplane at the speed of a descending parachute or sweeps you off of short runways in seconds! Easily operated through 3 positive positions by a seat-side control. A safety "must" for high-altitude, short-field flying!

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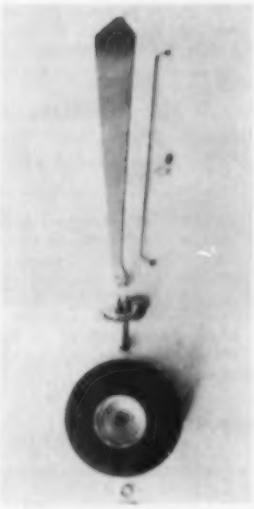
No complicated parts! Nothing to service. Always down and locked! And now the spring steel landing gear on the Cessna 180 has been moved 3 inches forward to make landings safer and easier than ever!



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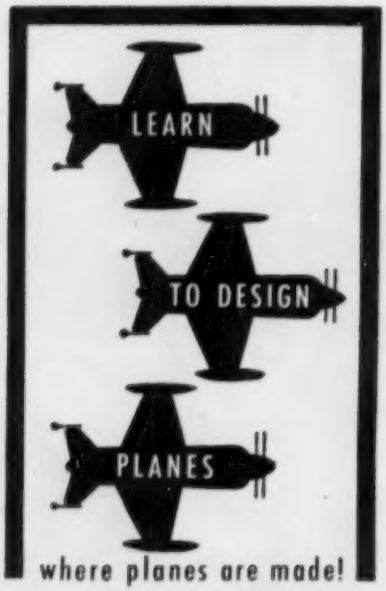

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EAGER IS THE WORD FOR THE BEAVER

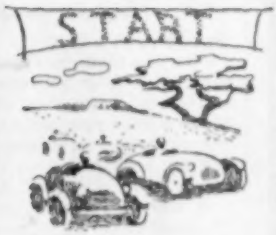
WHEN DE HAVILLAND of Canada decided in 1946 to design a rugged, utility plane, they asked for specifications from some of Canada's leading bush pilots—the result is the *Beaver*. Built to survive continuous hard use under the most strenuous operating conditions, the *Beaver* is making a name for itself throughout the world—wherever there's a tough job of work to be done.

Operating on floats, wheels or skis, the *Beaver* is an all-metal plane powered with a 450-hp *Wasp Junior*. Seating a pilot and six to seven passengers in quickly removable seats, the cabin has a highly stressed floor for concentrated freight loads. The exceptionally large doors permit 45-gallon oil drums to be rolled in sideways or pushed in upright. There are separate pilot's access doors on both sides of the cockpit.

Perhaps the most outstanding feature of this workhorse is its amazing take-off and climb performance which permits operation from tiny lakes or landing strips. Fully loaded to 5,100 lbs. gross weight, with zero wind, the *Beaver* landplane takes off in a distance of 558 feet and clears a 50-ft. obstacle in 1,014 feet. Cruising speed at 5,000 feet, is 139 mph and top speed 160. Maximum range is 1,145 miles.

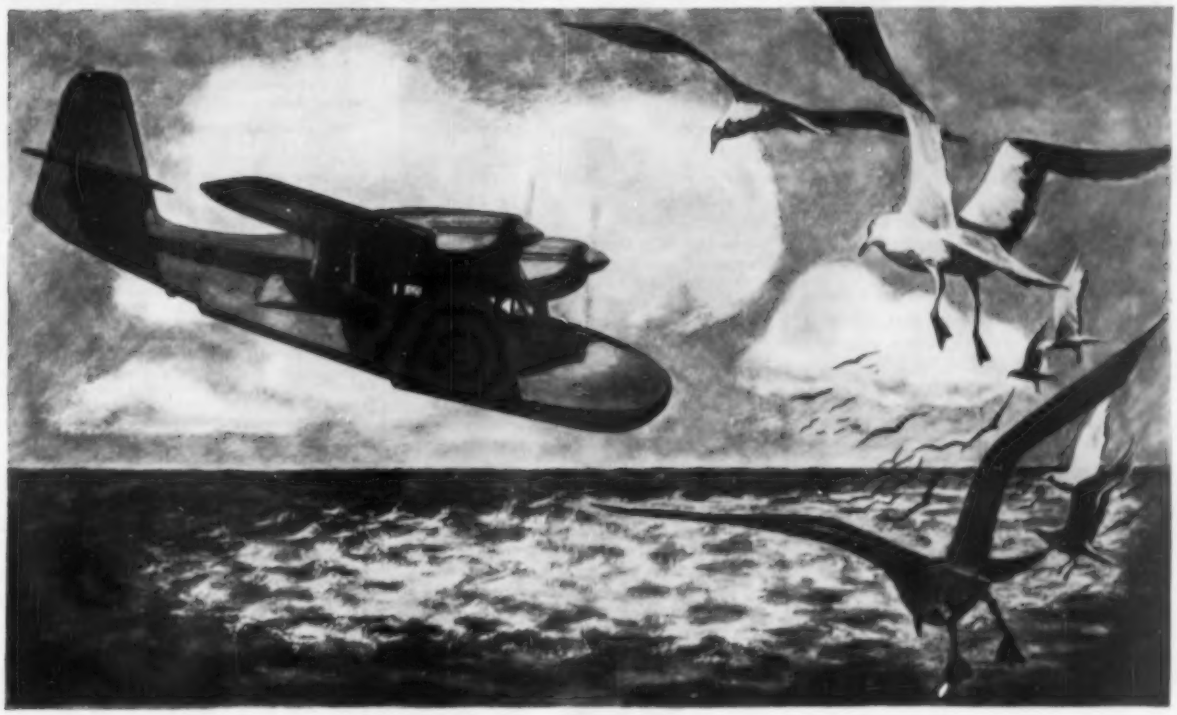
Making its military mark, the *Beaver* served with the U. S. Air Force and Army in Korea where, as the L-20, it operated as a frontline utility transport.

PLANE FAX



Your Best Week-end Flight Plan for April

Fly to Monterey, Calif., for the annual Pebble Beach Road Races, April 16 and 17. Plan to land at Monterey Peninsula Airport for quality Standard Aviation products and service.



The flying eyes of the tuna fleet

Scouting for tuna! That's W. H. "Hank" Coffin's job every spring, when the tuna start up the Mexican coast. From Whiteman Airpark, Pacoima, California, he flies to Ensenada, where he takes off at dawn to search for the seagulls that fly above the huge schools. He lets down from 5000 to 50 feet to make sure the fish are tuna, then radios his position to the waiting "clipper" boats.

"It's fun to fly low over a sea that's churning with tuna, just as long as I can depend on my plane and its engines," says Mr. Coffin. "I always use RPM Aviation Oil to keep my engines in top running condition—it gives me more safe flying hours. It stops pre-ignition and rough running that's sometimes caused by ordinary compounded oils, and it keeps engines clean of carbon and sludge. With 'RPM', I've been getting 200 extra hours between overhauls.

"I make my ocean flying safer, too, by using Chevron Aviation Gasoline 80/87. It gives me plenty of extra power when I need it, and it's ended the trouble I had with fouled spark plugs when I used gasolines with higher lead content. It leans down for economy, too, at cruising speed."

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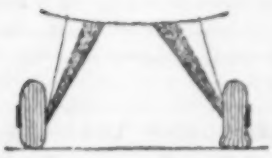

TIP OF THE MONTH

It's always a good idea to check your tires before take-off. If one tire is softer than the other, it can cause a ground-loop when you land.

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Blaney Park

(Continued from page 43)

sites to pitch a tent.

Two can bunk in a motel unit for $11 per day each or you can get an airport cottage for twice that and tie your airplane outside your window. If you prefer the woods and water and your own cooking, log cabins for four are available for $60 a week, and they throw in a boat.

A trip to Tee Lake to visit Dr. Karl Christofferson, for 25 years an internationally known ornithologist, is something to treasure for life. A few hours with this famed philosopher out of whose

Blaney Park 1929 deer season. Ted Abrams, Bud Hammond and Dutch Hammond with OX-5.

hands wild geese and the wary black ducks come to feed each year, is really royal privilege. The naturalist has cataloged 225 species of bird life around the lake, and banded 25,000 of them in his research studies.

A trip to the Paul Bunyan museum is another must. Here are assembled the relics of old lumbering days.

There is a dude ranch at the edge of the airport and miles of trails inviting the horseman. Good roads for motoring and bicycling and unlimited areas for those who like to hike.

You won't be at Blaney long before some friendly guest, and there doesn't seem to be any other kind, will ask you if you have been to the Bear dump. Everyone around sparkles with excitement and you will be sure you are in for some local initiation. You get wary and answer cautiously. But there is no catch to it. It sounds silly when they explain it but somehow you get into the spirit too. It's just a ravine a mile or so

Flying Farmers visit Blaney Park each year.

out where the refuse from the kitchen is dumped. But the feature attraction is to watch the big black bears and cubs come out of the woods to feed. They are always prowling through the rubbish, funny and clumsy. But when one apparently just taps a huge can that is in his way, and it goes sailing hundreds of feet, the power of these wild beasts is realized and there is a sudden urge to get back into the car which brought you. END

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November 15, 1954

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As I have been a member of A.O.P.A. for several years, I want to make the following statement.

Flying, whether it be for business or pleasure, is a part of the flyers life. In most cases, if you fly it is because you choose to do so. In any case, the flyer is subject to certain rules and regulations. We, as private civilian pilots, have no one to go to bat for our rights unless every pilot gets together as a body through the A.O.P.A., the only organization that has been willing to stand up toe to toe with the CAA and CAB and try to work out a solution best for all.

I think any person interested enough to learn how to fly should find it his obligation as a free pilot to help support the organization that is doing everything possible that he may fly.

I want to thank officers and the staff of the A.O.P.A. for the privilege of being a member of a fine organization. They certainly have been a great help to me.

Sincerely,

George R. Brousman
A.O.P.A. #[illegible]

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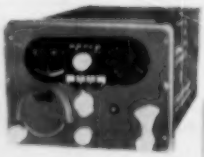

rely on

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NATIONAL AERONAUTICAL CORPORATION
Ambler, Pennsylvania

Jet Stream

(Continued from page 15)

mation of clouds, the amount of rain, snow and other precipitation, and the movements of warm and cold fronts are controlled by the upper air currents. By comparing data provided by research pilots on such things as changes in temperature at different points and levels in the jet stream, amount of turbulence, and formation of ice crystals, with ground conditions at a predicted time, the forecasters have found a new and important tool for ground weather forecasting.

Jet pilots have discovered by experience that certain tell-tale cloud formations may be used to determine the presence of these powerful winds. White feathery wisps of tufted trails at high altitudes, and small rounded white clouds which form delicate wave patterns and often take on tints of green and red near the sun, are both calling cards of the jet stream. Pilots are learning to recognize these signs and to use them to advantage. With each increase in speed of new planes, there is a corresponding increase in fuel consumption. Some experimental models carry only enough fuel for three or four minutes and even operational fighters are considerably limited in combat radius by their ability to carry fuel. For efficient operation, it is an absolute necessity for jet planes to fly at the altitudes through which the jet stream flows. Pilots must recognize its effect—and fast.

Preliminary information gathered from the probing flights so far has produced some interesting facts. For one thing, certain mathematical relationships have been developed from the flight data. It is now possible to locate the center of the jet stream and determine its central intensity by having two wind reports at jet stream level on either side of the stream. This will greatly aid forecasting and even positioning of aircraft in flight.

It has also been determined that the width of the jet stream, both horizontally and vertically, is related to its central intensity; the stronger the jet, the thicker the whole stream. Vertical shear in the wind speed (change of speed with change of height) has been measured as high as 72 mph within 1 mile. Horizontal shear on the north side of the jet stream measures as high as one knot per mile.

Turbulence within or near the jet stream core has been of less intensity than turbulence in a thunderstorm. It is more pronounced where wind speed changes rapidly with height. However, there is little or no warning to pilots of jet stream, or "clear air" turbulence such as there is in the case of a thunderstorm. Consequently, a speeding plane can be subjected to severe strains before the pilot realizes he is within jet stream turbulence. Several accidents have been caused by just such a situation.

Speeds of the stream have been discovered higher and higher as the probers continue their research flights. Naval pilots found one measured wind of 275 mph over a distance of 28 miles. Captain Dowd, in his B-29 flying laboratory, picked up a jet stream on a trip from Edwards Air Force Base, Calif., to MacDill Air Force Base, Fla. He flew it half-

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way across the country before breaking south to go into Tampa and during this time the ground speed exceeded 525 mph. Considering the average top speed of his B-29 as 300 mph, it is evident that the stream gave him quite a push. Average speed for the entire trip was 422 mph, since 1,500 miles of the total distance of 2,500 miles were flown in the jet stream.

Now in its early stages, Project Jet Stream is expected to furnish much more information to the scientists by the time all flights have been completed and the data have been compiled and studied. Present Air Force plans call for continuation of the project throughout 1955 while Navy's Project AROWA hopes to keep on probing for at least two more years.

It requires time but this mysterious weather phenomena is gradually being solved to a point where very soon it will be an important weapon for military use and a high economy for long range civil commerce. END

Learned About Flying From That!

(Continued from page 46)

the strip, my right gear hit something solid. I instinctively jammed on brakes so hard my tail jumped into the air. I could see a hole about a foot wide torn in the mahogany leading edge and back to the front spar. I got out and peered under the wing. There it was, a big piece of concrete reinforcement wire, made of quarter-inch steel rod. The maintenance crew had dug a hole in the concrete and pulled the wire up to three feet above the surface; then failed to put markers around it.

I felt the tower boys should have warned me of the obstruction. I did not know until later that they knew nothing of the hazard. After examining the damage, I decided it would be safe enough to fly to a near-by commercial field and get temporary repairs. I reported the damage to the control tower and advised them of my decision.

I was cleared for take-off. The ship seemed to take the air as easily as ever and I could scarcely detect any difference in the way it flew. Soon I was on the ground again, discussing repair of the damage with a mechanic when an Air Force Lieutenant drove up. He introduced himself as the claims officer and asked if I was the pilot who had reported hitting an obstruction on the municipal field. He said the Air Force had jurisdiction over the field and was responsible for its condition. He told me the tower boys knew nothing of the obstruction and that the Air Force would pay for the damage to my ship, if I would fill out a claim sheet. I assured him I would be more than happy to do so and thanked him for contacting me so promptly.

I don't know whether Friday the 13th had anything to do with my sequence of misery on that day in March, but I do know I gave bad luck a big assist when I failed to check weather thoroughly. And I now know I should not assume the condition of a taxi strip to be good because it is on a large, heavily used airport, and the tower directs you to use it. END

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MAILBOX

(Continued from page 9)

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"Comparable figures for private planes are not available but the 1950 edition of this booklet states that the rate for 1949 was about 100 times that for scheduled air carriers. Applying this ratio to the figures given above for scheduled airlines gives a fatality rate of 70.0 per 100 million passenger miles. You will observe that this is about 24 times the rate of passenger automobiles.

"Another way of illustrating the hazard is to compare the fatality rate produced by a limited amount of private planes flying to the death rate from all other causes combined as shown by a mortality table constructed from our own experience. Let us assume that a man aged 35 flies 50 hours annually in a private plane. According to our information the probability of death from the 50 hours of flying is equal to the probability of death from all other causes combined. In other words, under these circumstances, if death should occur, it would be an even bet that it resulted from an aviation accident."

This, then, is evidently the basis for the "aviation riders" which are charged private flyers by all the major life insurance companies. But even so, on a trip of a thousand miles, one's chances of safe arrival in his plane would be something like 1,427 to 1.

I am sure you recognize the handicap imposed by such insurance penalties which single out pilots as a poor risk group. If the statistics are correct, and particularly, if they represent a fair appraisal of hazards by private aircraft as against other modes of travel, I think these facts should be known to all. Perhaps they might set off a concerted effort toward greater safety in private flying. If, on the other hand, the statistics are not correct or do not tell the whole story, what, then, is the pilot's side of the insurance problem?

Whatever the actual facts may be, their discussion and recognition by those who fly could not help but promote safer flying.

DALE GROOM, M.D.
Charleston, S. C.

• *Grist for the mill is the* BRIEFINGS *item on page 10 of this issue which announces issuance of life insurance at standard rates to aircraft pilots by Security Benefit Life Insurance Company of Topeka, Kans.*—ED.

FLYING MARINE

I am a Marine now but, before I enlisted six months ago, I did quite a bit of flying for a kid with a small part time job. When I enlisted in the Marine

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Corps I thought I would have to stop flying for a while. Then I read one of your editorials and that was the spark plug I needed. The next time I got liberty, I went to the nearest airfield and started to check out in a Cessna 140. However, I am being shipped overseas and don't have enough experience to solo the Cessna yet. But if there's an airfield across the seas that I can get to, you can be sure I take up where I left off. Your editorial did a lot to me and for me.

PVT. A. J. BENNETT

Camp Pendleton, Calif.

NEEDED—A FLIVVER

. . . Your recent editorial regarding "a flivver" interests me. I don't think we need a flivver nearly as much as we do a high school training program similar to the Driver Program now prevalent in every school. General Motors, through the local Chevrolet dealer, donates a car to the school and the State and County pay for the gas, oil and teacher.

G. L. SETMAN

Quakertown, Pa.

. . . Your editorial, "Needed—A Flivver," was noted just after completion of the third successful "Teen Flight" staged at Metropolitan Oakland International Airport on Sunday, December 5. This operation was sponsored by the Metropolitan Oakland Unit AOPA with the aid of the Air Scouts of Squadron 1, BSA, Oakland.

Through the cooperation of the airport and tower, 21 private aircraft flew 190 teen-age passengers in four hours.

While this type of activity does not provide a continuing flight program for the youngsters, we believe it does arouse an interest in aviation which would be considerable if done on a nationwide scale. We believe that anyone who flies once will fly again and with that in mind try to get all the "first flighters" possible into the air.

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World War I Spad

(Continued from page 22)

There's that fuel warning. The gas has stopped trickling. Let's come in for a landing. Here's where you in the *Spad* are one up on the modern planes. There is no carburetor heat control because the Hisso has a hot-water-heated manifold. Better watch the attitude of your *Spad*. "It has a thin wing, a fine wing for a jet plane," Bill Boone comments. As for cutting back your power in the final approach glide, Bill warns, "You're all right as long as you have power on."

The *Spad* is likely to provide you with a hot shower bath upon landing, Col. Reid and Bill Boone agree. "It used to blow hot water in my face from the expansion tank every single time I landed. The Hispano-Suiza engine is susceptible to steam cramps," Boone remembered ruefully.

Now you are about to land the *Spad*. Wiping the water off your goggles, you concentrate on keeping clearly above critical stalling speed as you approach. No, no—that nice, wide concrete isn't for you, it's for the modern planes. You land on the bumpy turf. Your narrow wheels, closer together than on a modern plane, with an axle between them susceptible to being bent, will make danger of a ground loop greater, too. You have a tailskid. A concrete runway will knock it off. Boone, after losing four or five, changed from wood skids to steel. He also beefed up the fuselage section around the skid. Well, why not land on the concrete, with a steel tailskid? Don't forget, you still have to stop your landing roll somehow. The *Spad* has no brakes. Its tailskid doubles as a brake, digging into the turf. How many pilots rolled into the fence because the ground was too smooth may never be known. With those narrow wheels, you're twice as careful about ground loops too. "I ground-looped my first aircraft in many years of flying on one of my first *Spad* landings," Boone disclosed. "I got a wingtip that day and, luckily, it was no more than that."

Maintenance was a nightmare for the *Spad* mechanics and pilots. Legion are the tales of planes repaired with baling wire, chewing gum, adhesive tape and prayer. Nowadays, due to standardization and interchangeability of parts, you generally can get replacement parts at any field. Those parts, being better machined, and to closer tolerances than was possible a generation ago, will fit better and last longer. Since the late thirties, planes have been required to have dual ignition systems. A study of early engines once showed that the biggest single cause of mechanical failures was the single ignition system.

You climb out of the *Spad* in front of the airport manager's office again and give the fuselage a friendly pat. "Those World War I planes were all right," you say, "for pilots who were pilots." END

The plane shown on page 48 is a Piper PT-1, powered by a 130-hp Franklin. Built in 1942 as an experimental military-type trainer, it is the only one of its kind and is based at Fullerton Airport, Calif.

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Briefings . . .

(Continued from page 56)

dimensions 18" x 5½" x 4"; and price is about $68.50. Write to Victor Tool Co., Oley, Pa., for free descriptive booklet.

HYPERSONIC SPEED will be the subject of a scientific study by aeronautical engineers of Ohio State University who will conduct a research project on the flow of air at speeds ranging up to 15 times the speed of sound. The project is a contract job for the Army's Cleveland Ordnance District.

FLYING TEST BED for turbo-props is the latest job of the B-47. Curtiss-Wright T49 engines have been installed on this

XB-47D. The ship retains two of its six turbo-jets.

THE AIR FORCE has awarded a contract to Ryan Aeronautical Co., for development of a jet-powered vertical takeoff aircraft. Speed of the plane is expected to be in the 600 miles per hour class. Other VTO developments are Navy's turbo-prop powered Convair XFY-1 and Lockheed XFV-1.

AN ALL MAGNESIUM AIRPLANE, an experimental F-80C, is now undergoing flight tests at Mitchel AFB, N.Y. The airframe, almost 100 per cent constructed of magnesium, was built by East Coast Aeronautics, Inc., for the Air Force. Magnesium is the best substitute known for aluminum; its supply is nearly inexhaustible; it is extremely efficient throughout the usable temperature ranges of light alloys; and its thicker skin should decrease ground handling damage and assembly manhours.

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Deep Green Crack-Up

(Continued from page 17)

bit awed by the ordeal ahead. At six next morning they were on their way, breakfastless but full of hope. Rain had tapered to a drizzle and Ruales set their course northwest, judging direction by faint glow of the sun through thinning clouds. As he'd expected it was impossible to continue long in a straight route, but he tried to maintain a general march north and slightly west. "If my estimate is right," he told the others, "th Penal Colony should be about 40 kilometers in that direction."

Around nine that morning Martinez held up a hand. Stronger and stronger grew the roar, and then above them, glimpsed through gaps in the jungle roof, an Army C-47 zoomed past at low altitude. Ruales had been expecting this—search planes when he failed to arrive on schedule. But he knew its hopelessness. From the air, all jungle looks monotonously alike. And the pilots up there wouldn't know he'd been off-course.

Martinez and Alvear were running around frantically waving arms and trying to find an open spot when a second plane came over, but the thick canopy of green hid them as effectively as if contrived for camouflage. And Ruales calculated that chance of searchers spotting the small fuselage buried deep in its nest of leaves and lianas was about one in 10,000, so he urged the men on their way. Thenceforth, in days to follow, they paused but briefly to stare with longing eyes at the C-47's buzzing back and forth.

"Even if they found the wreckage, what could they do?" Ruales asked. "They can't land. They won't know if we're alive. And if they can't see us, they can't drop supplies by chute. Better push on before we starve."

Hunger gnawed at bellies the first few days until it became almost unbearable. Then it abated somewhat, assuaged by copious draughts of water from ever-present *quebradas* in the bush. Doggedly, they fought onward, with rest periods growing more and more frequent as strength drained away, sapped by the ordeal of bare-handed battle with the jungle, and wearing of clothes which never dried due to constant onslaughts of rain. Fruits and berries tempted but the wanderers dared not taste, knowing well that many poisonous kinds grew here and, without gun or bush knife, their hope of getting meat had dwindled to zero.

Day by day they struggled along their trueling route, from dawn until four each afternoon. "Go on—leave me," Martinez moaned on the fifth day when Ruales awakened him. "I can't take another step."

"Nor I," chimed in Alvear. "I'll stay with you. My feet are blistered raw."

Ruales coaxed and pleaded and finally the other arose, and again began to plod wearily northward. Later that day, Ruales had his hands full when both companions showed signs of jungle-craziness, as often happens to men lost in the wilds. He at last managed to calm them, begging them to stick it out another day or so. "I think I recognized that river we

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crossed this morning," he said, to bolster hope. "We should be nearing the Penal Colony."

That night he took the first watch while the others fell exhausted to slumber under a leaf-thatch built with bare hands. Skies had cleared and, as darkness deepened, he strained eyes to the westward over the top of the jungle, for he'd made camp high on a knoll with this idea in view. Far, far away he thought he could detect a faint glow in the sky—light from the Pastaza-Oriente airbase at Shellmera. In mind he plotted his lines and, when the glittering Southern Cross flamed in the sky, he took rough bearings. Then he fell asleep without waking his companions, risking an attack in order that they might be fresher for the coming day.

"We must be close," he told them enthusiastically at dawn, and explained his calculations. Words had effect and they plowed ahead with new vigor.

At 9:30 a guard at Ecuador's jungle Penal Colony stared in disbelief as three scarecrows staggered into the clearing where he was on duty watching convicts chop out a new banana plantation. Axe blows had guided the tattered three to this spot. The guard raised his rifle, then as quickly lowered it, recalling the lost plane report.

Fresh clothing was pressed upon the survivors, along with food which their stomachs promptly rejected. Again they tried and soon could hold down soup. For six days they had fought the jungle, and had licked it in an adventure such as few men survive. Today, Lt. Ruales is back jungle-hopping in another plane.

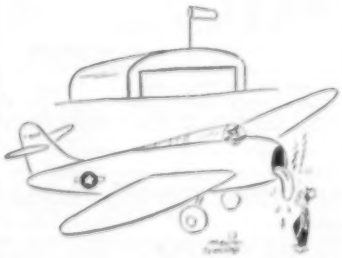
"You can bet one thing," he avers. "Now I carry matches, flares, food, a bush knife and spare compass. It's tough to learn the hard way in a deep green crack-up."

On occasion when he flies over my snug jungle barony, he gives a wing-waggle as if to say, "Thanks for keeping a place where I can let down in case of future mishap."

As for Martinez, he gazed at his co-adventurers shortly after escape.

"Now I'll take up a matter with my patron saint," he told them solemnly. "An ordeal like that will last me a lifetime! Hear me as I vow this: I'm an active officer until I'm ordered on another jungle flight; then, by Jove, I'm Lt. Col. Martinez—retired!"

Ruales still laughs about that. END



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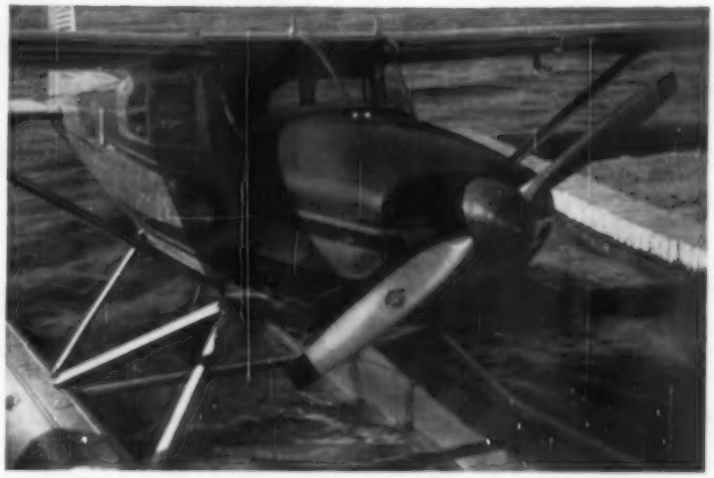

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PILOT AIDS

By BOB BLATT

DOOR CHECKS

Door handle checks on all *Cub* trainers at Westchester Airport, Inc., has eliminated damage to door mechanisms and saved many repair jobs, according to Dave Finger, Owner-Manager of the airport. Previous to installation of checks, students would pull handles in wrong direction, regardless of signs. Often door mechanisms would be damaged and fabric ripped.

A 12-in. length of window sash chain connecting the end of the door handle with the bottom of the door, forms the "check" to insure against turning handle wrong way. Each "check" requires about 20 minutes to install at a cost of about 20 cents for parts. Picture shows Dave Finger, left, explaining gadget to Donald Graap, Private Pilot.

WINDOW WEDGE

A small wooden wedge proves effective in holding the left-side windows of Piper *Cub* trainers in the desired position. Use of these wedges has eliminated cracked windows according to Hank Wujcik, A & E Shop Foreman at Westchester Airport, Inc., who devised them.

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March 12-17—Miami-Havana Air Cruise sponsored by the Florida Aero Club, Inc., 375 N.E. 154th St., North Miami, Fla.

April 16-20—Annual convention and business meeting of the American Association of Airport Executives, El Conquistador Hotel, Tucson, Ariz. Contact Exec. Secty., P. O. Box 1191, Tucson, Ariz.

May 20-22—Tampa Centennial Aviation Fiesta, Tampa, Fla. Air shows, displays, parties, barbecues and entertainment. Contact Greater Tampa Chamber of Commerce Aviation Committee.

June 18-25—Third Annual JayCee Transcontinental Air Cruise, Palm Springs, Calif., to Philadelphia, Pa. For complete information, contact Phila. Jr. Ch. of Commerce, 17th & Sansom St., Phila. 3, Pa.

July 2-6—Ninth Annual All-Woman Transcontinental Air Race, Long Beach, Calif. to Westfield, Mass. Contact Mrs. Betty H. Gillies, Chairman, at Box 5336, East San Diego, Calif. for details.

July 2-14—National Soaring Contest, Elmira, N. Y. This year represents the 25th anniversary of the National soaring meets and also of all soaring at Elmira.

Oct. 11-13—Annual convention of the National Association of State Aviation Officials, Dallas, Tex.

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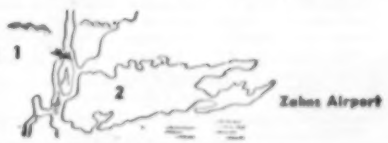

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